A TEXT-BOOK

OF

DISEASES OF THE

NOSE AND THROAT

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PREFACE.

My recent work on the Nose and Throat in two volumes having been considered somewhat too voluminous for the use of students, it has been thought best to prepare the following volume, designed especially for the use of the general practitioner and student.

The work is mainly a condensation of my former two volumes into one, in which the effort has been to retain all that is of practical use so far as possible. This has been accomplished by eliminating those parts of the work which were of value only for reference, and I trust that it has been done to the satisfaction of the reader. Some new material has been added and some few changes made, but in essentials the single volume is the same as the larger edition. The work of reduction has been done by my friend, Dr. Aimée Raymond Schroeder, without whose valuable assistance this publication would scarcely have been feasible.

F. H. B.

41 Park Avenue,
August, 1896.

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SECTION I.

DISEASES OF THE NASAL PASSAGES.

DISEASES OF THE NASAL PASSAGES.

CHAPTER I.

METHODS OF EXAMINING THE UPPER AIR PASSAGES.

The essential physiological process by which the human voice is produced in the larynx, its pitch regulated, and its volume and other qualities governed, was a source of speculation even in the earliest days of medicine, and the ingenuity of many able investigators, such as Bozzini, Babington, Bennati, Avery, and others, was exercised to devise special appliances by which the movements of the vocal cords might be seen. None of these devices proved successful, however, until, among others, Manuel Garcia, a distinguished teacher of vocal music in London, interested himself in the subject. He obtained a view of his own larynx and the results of his investigations of the function of the vocal cords in phonation he presented before the Royal Society of London in a paper entitled "Physiological Observations on the Human Voice."

Garcia's method was exceedingly simple. An ordinary dental mirror, inclined at a proper angle, was placed well back in the fauces in such a manner that it should receive the direct rays of sunlight, while, at the same time, the visual image was reflected back in the same direction and perceived by Garcia in a hand-mirror held before his eyes. Garcia's obervations were published merely as a contribution to vocal physiology. Türck, of Vienna, however, soon after, becoming acquainted with Garcia's experiment, conceived the idea that this method might be employed for the diagnosis of laryngeal disease. He failed to improve on Garcia's simple manipulation, and accomplished no encouraging results. Czermak, of Pesth, however, took up the matter where Türck left off, and, improving on his methods, succeeded in demonstrating conclusively that this device might be made to render the greatest possible service to medical

science, both as a means of diagnosis and as suggesting improved methods of treatment of diseases of the upper air passages. Czermak's success was due entirely to the fact that, discarding sunlight, he resorted to the use of artificial light, which was managed after the manner already suggested by Helmholtz and perfected by Reute.

The Laryngoscope.

This term is used to designate the special illuminating apparatus by which the upper air passages are examined, and of course applies equally to rhinoscopy and laryngoscopy. The essential feature in the examination of the upper air passages is the projection of a powerful light through the anterior nares for the practice of so-called anterior rhinoscopy, or into the open mouth for the inspection of the pharynx, or so-called pharyngoscopy. In addition to this, as in laryngoscopy and posterior rhinoscopy, small mirrors are introduced into the fauces, by which the illuminating rays are deflected to those parts which are without the line of direct vision.

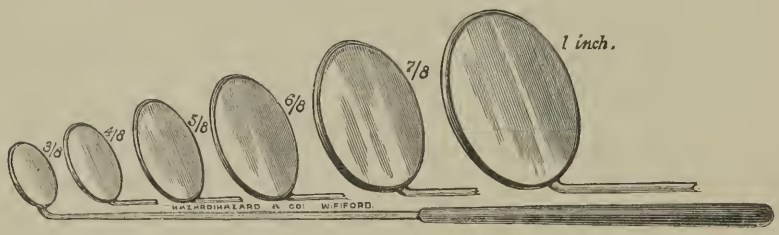

Fig. 1.—Throat Mirrors, Actual Size, from No. 0, ¾ inch in diam., to No. 5, 1 inch in diam.

The essential parts of the laryngoscopic apparatus then are: 1. The laryngoscopic or rhinoscopic mirror. 2. The source of illumination, or the light. 3. The concave reflecting mirror.

The Throat Mirror.—The laryngeal mirror is a small round mirror with a German-silver frame, and attached by its rim to a slender wire stem at varying angles, the whole measuring from six to seven inches in length. They are made from three-eighths to one inch in diameter. The best mirrors are made of very thin glass and with a narrow rim such as will afford the largest reflecting surface to the smallest bulk, the stem being sufficiently stout to admit of the application of considerable force without bending.

The Light.—The illumination may be derived from the sun, the oxygen-hydrogen light, a gas-jet, or an ordinary coal-oil lamp. If gas is used, the Argand burner gives undoubtedly the better and steadier light, although ordinarily a coal-oil lamp is quite satisfac-

tory in giving a whiter and more intense light than the usual city gas supply, and of these undoubtedly the best is one mounted either with the Duplex or Rochester burner. Sajous states that the whiteness of this light may be increased by dropping a small piece of camphor into the oil, a suggestion which I have verified. The direct rays of the sun afford by far the best source of illumination, and should always be used where available, and especially in the first examination of the case. Unfortunately we have not always the sunlight, and any one devoting his attention to this branch of medicine should make use of the oxyhydrogen light, since it is only by those powerful illuminators that the parts are brought fully under that nicer inspection which enables us to make a thorough diagnosis. Lennox Browne was, I believe, the first to devise an apparatus of this kind suitable for office work. His apparatus is, however, unnecessarily complicated. Sajous speaks very highly of the so-called albo-carbon light which consists of a metal globe containing a material called albo-carbon, located in such a way that it is subjected to the heat of the flame, while at the same time the gas passes through it before combustion. This undoubtedly gives a very brilliant white light. The incandescent electric light offers no advantages over the ordinary gas-jet or coal-oil lamp. The various devices by which a small incandescent light is attached to a throat mirror, modelled after Trouve's polyscope, I think are to be regarded as mere playthings and of no practical value. The same may be said also of the incandescent light attached to the head-band.

The Reflecting Mirror.—The really important feature of every laryngoscopic apparatus is the concave reflecting mirror of Reute, since it is by this device that the rays of light are sufficiently converged to thoroughly illuminate a part, even if the light is not particularly intense, and furthermore it enables us to manipulate and direct the illuminating rays at our convenience. Whatever part is to be examined, it is absolutely necessary that this concave mirror be perforated in the centre, that the illuminating rays and visual rays shall be exactly in the same line. This mirror may be attached to a simple head-band carried on the forehead, or it may be attached

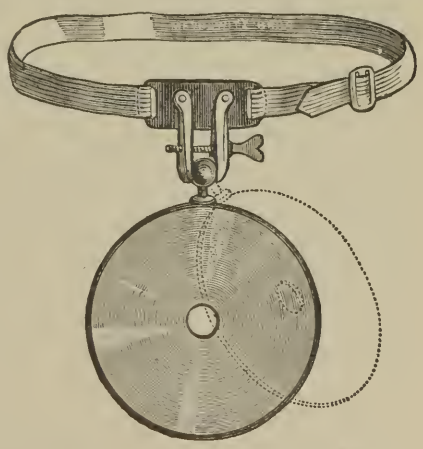

FIG. 2.—The Author's Head-Band and Mirror.

to a fixed apparatus. The head-mirrors in use are rather heavy and large. As a matter of fact the lighter the mirror the better, and for this reason I much prefer a smaller-sized mirror which possesses all the advantages and none of the disadvantages of the larger ones. Fig. 2 shows the writer's head-mirror; it is two and a half inches in diameter, with the knob attached to the periphery of the frame which gives unrestricted movement to the mirror. In addition to this, the split socket is only of sufficient size to receive the knob, while the plate to which the socket is attached is but one and a half inches long.

The band is made of half-inch alpaca braid, which is far superior to elastic, is worn with much more comfort, and possesses sufficient elasticity to maintain the instrument firmly in place. In addition to this, the whole affair is perfectly flat and is carried easily in the vest pocket.

The Fixed Apparatus.

In the early days of laryngoscopy the idea seems to have prevailed that this art could only be practised by means of a somewhat elaborate apparatus. This idea, I think, had its impetus largely in the introduction of Tobold's instrument, which seems to be the pattern on which most of the later laryngoscopes were constructed. Tobold's apparatus, though much used, has no practical advantage over a simple head-mirror, which, with a good, strong source of light, affords us as good a method of practising laryngoscopy as the most elaborate apparatus.

Mackenzie's light condenser shown in Fig. 3 is a simple and useful apparatus, and consists of an upright metal cylinder about three inches in diameter, with a fenestra in the side, into which a plano-convex lens two and a half inches in diameter and comprising about one-third of a sphere is fitted. The whole may be easily fitted over a coal-oil lamp or gas jet.

I regard the use, however, of an elaborate laryngoscopic apparatus unnecessary, as examinations can be thoroughy made by means of a head-mirror and a good light.

The Examination.

The best source of illumination is sunlight. These rays are utilized in the small device shown in Fig. 7 which consists of a plane mirror, about four inches in diameter, mounted on an upright support, to which it is attached by a universal joint. This may be

placed in a window, exposed to the sun, and turned in such a direction that its rays shall be deflected upon the concave reflecting mirror of a fixed apparatus, or in such a direction that they fall upon the forehead-mirror of the operator, as shown in the same illustration. In making use of sunlight, the unpleasant effect of the rays striking directly upon the eye, is easily avoided by placing the heliostat a few feet above the right shoulder of the patient and in such a manner that the rays shall fall at an angle of about forty-five degrees upon the mirror.

In the absence of sunlight, a very satisfactory examination can be made by the aid of an ordinary coal-oil lamp or gas jet.

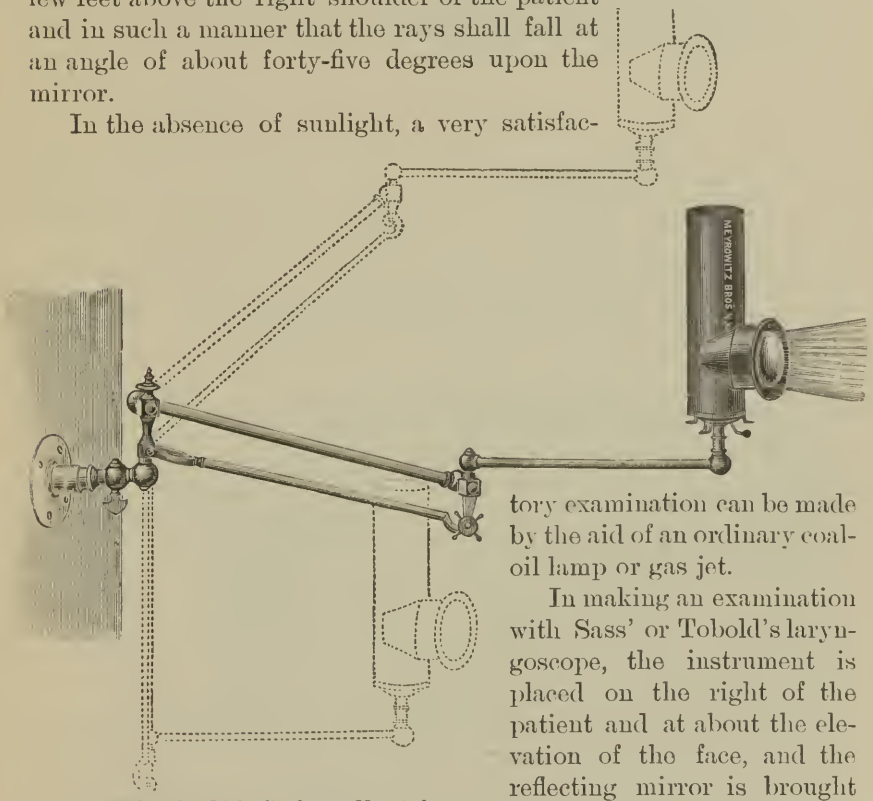

Fig. 3.—Mackenzie's Light Condenser Mounted upon a Ratchet-Movement Gas Fixture.

In making an examination with Sass' or Tobold's laryngoscope, the instrument is placed on the right of the patient and at about the elevation of the face, and the reflecting mirror is brought into such a position as to intercept the illuminating rays and deflect them upon the face of the patient.

In using Mackenzie's condenser, the patient is placed in much the same way and the rays of light are made to fall upon the head-mirror of the operator. The ratchet-movement gas fixture, shown in Fig. 3, is a convenient mounting, the lenses being easily adjusted to the level of the mirror on the forehead of the operator. In using this instrument, one's movements are somewhat hampered, as the head has to be held in one position, which is necessarily somewhat wearisome, whereas with the unhooded lamp or gas jet, the rays can be

easily intercepted in whatever position or at whatever level the head of the operator may be. After all, any method of examination is largely a matter of preference on the part of the operator, and the less complicated the procedure and the apparatus the better.

A special operating-chair is recommended by many authorities, but I think an ordinary straight-back chair is much to be preferred, and it enables the surgeon in operating outside his office to adapt himself more readily to improvised conveniences.

Rhinoscopy.

The nasal cavity is examined by illumination and direct inspection through the nostrils, called anterior rhinoscopy, and also by placing mirrors in the fauces so that the rays of light are reflected through the posterior nares. This is known as posterior rhinoscopy.

Anterior Rhinoscopy.—This examination is made by dilating the flexible portions of the nostrils by means of a suitable speculum, and illuminating the cavity by means of light reflected from the concave

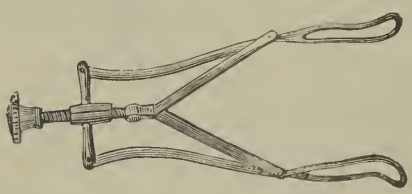

Fig. 4.—Fränkel's Nasal Speculum.

Fig. 5.—Goodwillie's Nasal Speculum.

mirror, so placed that the focus of illumination may fall as nearly as possible upon the part to be examined.

A number of instruments have been devised for dilating the nostril for this inspection. In Fig. 4 is shown Fränkel's instrument, composed of two blades regulated by a set screw. It is only partially self-retaining, however. Goodwillie's speculum, shown in Fig. 5, is a much simpler device, whose action is evident from the cut. Its third blade, however, it seems to me, accomplishes no good purpose. Elsberg has modified Delaborde's tracheal dilator by inserting a set screw to hold it open, thus adapting it for use as a nasal speculum. This is an instrument of undoubted value in cases in which the parts are rigid and require to be opened with considerable force. The objection to this speculum is that it occupies one hand in its manipulation. Fig. 6 shows an instrument devised by the writer, in which the blades are placed at a right angle to the spring, and is so constructed that the instrument is thoroughly self-retaining, and holds the nostril

open excellently well, while at the same time both hands are left free for other manipulations. When properly constructed, this instrument has served a better purpose in my own hands than any of those mentioned. On much the same principle is a convenient little instrument devised by Jarvis.

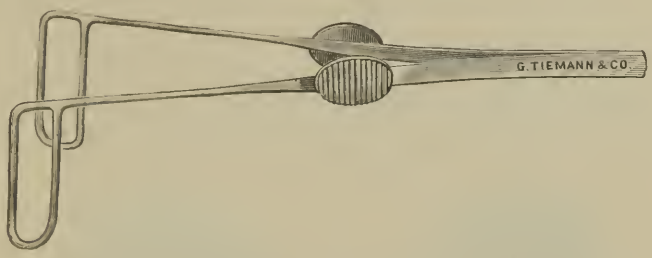

FIG. 6.—The Author's Self-retaining Nasal Speculum, actual size.

In making an examination of the parts, the patient is placed with his face directly on a level with that of the operator, and, the speculum being inserted, the bridge of the nose is grasped firmly between the

FIG. 7.—Method of Making an Examination of the Anterior Nares by Means of Sunlight, the Head of the Patient being in Position for the Inspection of the Inferior Meatus.

index and second finger, while, at the same time, the tip of the patient's nose is tilted up by the thumb, with a considerable degree of force, as shown in Fig. 7, in order that the light from the head-mirror may

be thrown into and along the inferior meatus. The patient's head, now, is to be turned very slightly, first to one side and then to the other, enabling the operator to successively inspect the lower portion of the septum and the face of the lower turbinated body. After these have been thoroughly inspected, the head should be thrown backward, as seen in Fig. 8, until the lower border of the middle turbinated body is brought into view, when, by the same lateral motion of the patient's head, the face of this body and that portion of the septum opposite are brought successively into view. This backward motion being continued, there is brought under inspection the

Fig. 8.—Anterior Rhinoscopy, the Head of the Patient being in Position for the Inspection of the Middle Turbinated Body.

main portion of the middle turbinated body, and finally its anterior termination, and the vestibule of the nose. This inspection having been made as thoroughly as possible, a ten or twenty per cent. solution of cocaine should be thrown in, and sufficient time allowed to elapse for the tissues to undergo thorough contraction, and the blood-vessels to become completely emptied, after which the same process should be gone through a second time. In this manner anterior rhinoscopy becomes of far greater importance even than posterior rhinoscopy, since by this means the whole of the nasal passages may be brought under examination, from the nostrils to the posterior nares, and after the membrane has been contracted by cocaine, a part of the glandular structure of the upper pharynx even can be inspected on both sides. By this means, information is obtained as regards the existence or degree of inflammatory action in the nasal mucous membrane covering the turbinated bones, the extent of hyperæmia, the

existence of deformities or deflections of the septum, the presence of polypi or other tumors, the character of the secretions of the part, whether mucus or pus, and the existence of ulceration, necrosis, etc. In looking directly down the nasal passages, the view of the lower turbinated body is very much fore-shortened, but when the cavity has been dilated with cocaine, as before stated, in many cases it is quite easy to recognize the posterior wall of the pharynx, as an elongated triangular patch, presenting a lighter color than that of the turbinated bodies. It is always easy to ascertain whether the pharynx is seen by this examination, by directing the patient to

FIG. 9.—Anterior Rhinoscopy, Position of the Head for Inspecting the Wall of the Pharynx, through the Nasal Passages.

swallow, or, better still, simply to enunciate the letter K, by which the levator palati muscle is brought into vigorous contraction, and thereby swings across the lower and outer portion of the posterior nares, the movement being easily recognized. The position of the head necessary for this inspection is shown in Fig. 9.

Another method of examining the nasal cavities consists in dilating each nostril by means of a speculum, after which the illuminating rays are projected into one cavity and against the septum, when the other cavity is to be inspected. It will be found that the septum is so thoroughly translucent that one of the nasal cavities will be fully illuminated by rays of light projected through it. The parts seen in this manner present quite a different picture from that shown by the direct illuminating rays, and information which it affords is not easily obtained by the ordinary procedure, the light being projected more directly into the recesses beneath the turbinated bones, and any

variations from the normal are more easily recognized. In addition to this, transmitted light brings out in a striking manner the irregularities of contour in the septum itself.

Posterior Rhinoscopy.—This examination is somewhat more difficult than that through the anterior nares, and requires therefore a nicer manipulative skill. In order that these parts may be brought into view, a mirror must be placed in the pharynx in such a way that light may be thrown up into the posterior nares, while, at the same time, the palate remains completely relaxed, and the tongue is prevented from protruding itself into the line of vision. Occasionally a patient is met with who will depress his own tongue in so satisfactory a manner as to tolerate the examination without the aid of instruments. Ordinarily, however, it is necessary to press the tongue down by means of the spatula. Türck's tongue depressor, shown in Fig. 10, though a somewhat elaborate and expensive instrument, is undoubtedly of value when the patient can manipulate the instrument himself. It is usually, however, better for the operator to manage the spatula. Some form of the folding spatula is very convenient, since it can be carried in the pocket.

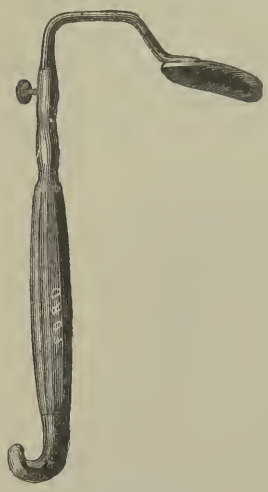

Fig. 10.—Türck's Tongue Depressor.

Depressing the tongue by means of the spatula would seem to be one of the simplest of manipulations, and yet, if awkwardly done, the fauces may be so irritated that the examination may be entirely impossible; on the other hand, if properly done, even an exceedingly irritable throat may be satisfactorily examined. It should be borne in mind that if the tongue is pressed directly down upon the floor of the mouth, the root is pressed backward into the fauces, which is generally enough to cause more or less severe gagging. On the other hand, if the tongue is drawn forward by the spatula, it can be controlled without exciting involuntary movements. The spatula shown in Fig. 11 is well fitted to accomplish this purpose. The blade

Fig. 11.—The Author's Tongue Depressor.

is a thin plate of metal three and a half inches long and one inch wide, tapering toward a handle, which is three inches in length and to which it is attached at a right angle. The slightly curved blade is fenestrated at its distal extremity to permit arching of the tongue into it, by which the organ is more firmly grasped.

In introducing the tongue depressor, its beak should always be carried beyond the arch of the tongue, that is, beyond the highest point at which the tongue is visible; otherwise, in pressing the organ downward, its anterior end will become depressed, while its centre will rise and interfere with the inspection. Furthermore, the beak of the spatula should be carried back to cover the arch of the tongue only; otherwise the pressure on the sensitive parts near the base of the tongue is liable to excite retching. The spatula should be held between the thumb and the forefinger, the thumb pressing against its angle, while the second finger passes under the chin of the patient. In this manner a grasp is maintained of the lower jaw, and control of the movements of the head secured. The tongue should be pressed downward and forward and the patient

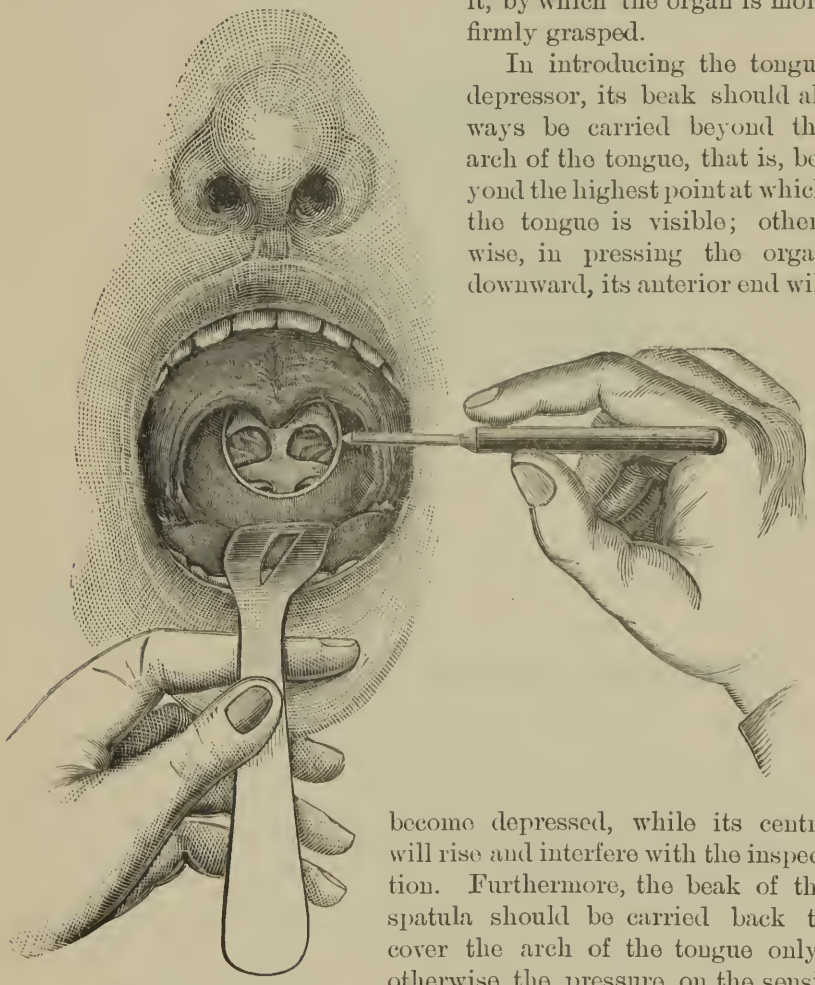

FIG. 12.—Method of Making a Posterior Rhinoscopic Examination.

instructed to breathe through the nose, that the palate may be relaxed. If retching occurs the examination should be abandoned.

In any given examination the largest mirror should be selected which can be introduced without touching the parts. The rhinoscopic mirror should be held lightly in the right hand (see Fig. 12), and passed backward somewhat edgewise, in order that it may go through the niche between the uvula and right pillar of the fauces without touching the parts. After it has reached the pharyngeal space behind the palate, by slightly rotating the handle from right to left between the fingers, the reflecting surface should be brought around so as to face the operator, and the mirror carried upward until its upper border is slightly hidden by the soft palate. The position of the mirror should now be at a right angle with the line of vision, and inclined slightly backward, the handle being held at one side, the shaft against the corner of the mouth, as seen in Fig. 12. The difficulty lies in the inability of the patient to control the palate, which if touched by the mirror is immediately drawn up against the posterior wall of the pharynx. The patient may be directed to

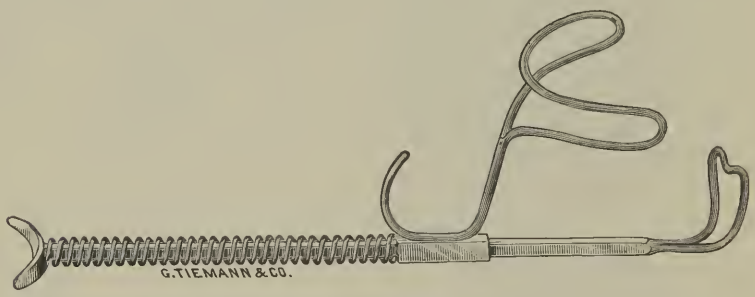

Fig. 13.—The Author's Self-retaining Palate Retractor.

breathe through the nose, but this is exceedingly difficult, as a rule, and the palate is more readily relaxed by uttering a nasal sound, such as "Eh," giving it as full a nasal twang as possible. If there is still difficulty in controlling the movements of the fauces, they should be anæsthetized by a ten or twenty per cent. solution of cocaine. This application is exceedingly unpleasant, giving rise to a curious sensation of choking or suffocation, but it is never attended with anything more than a temporary inconvenience.

As a last resort, other means failing to control the movements of the fauces, we may proceed to tie up the palate after the manner first suggested by Desgranges. This is done by passing a cord through each nostril to the pharynx, drawing it out through the mouth, when it is passed over the ear on each side and tied behind the head. The palate gradually yields to the traction and a broad space is afforded for inspection of the parts above. A soft rubber cord, as first sug-

gested by Wales, about one-eighth of an inch in diameter and a yard long, is much better than an ordinary cord. If any difficulty is experienced in passing the cord, a small velvet-eyed English catheter may be used, the stylet being inserted for passing it through the nares. This procedure is quite easy and draws forward the palates very satisfactorily for inspection or treatment of the upper pharynx.

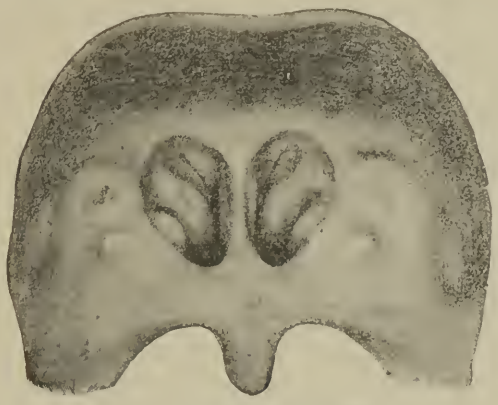

FIG. 14.—The Posterior Nares.

Palate hooks, palate retractors, combination rhinoscopic mirrors with retractors, such as Duplay's instrument and other devices, I have never found of much value. The most useful instrument is that shown in Fig. 13.

THE RHINOSCOPIC IMAGE.

The mirror being placed in the position described, the oval-shaped openings of the posterior nares will be brought into view. This posterior rhinoscopic image is shown in Fig. 14; it should be borne in mind that these parts are seen only in detail and not as a whole. Separating the choanæ, in the median line will be seen the septum, broad above and tapering to a sharp and narrow edge below. On each side of the septum will be seen, as dark cavities, the nasal passages, with the turbinated bodies projecting into them from the outer wall of each. The superior turbinated body will be just visible, a light reddish band, in the upper part of the image, and seeming to slant upward and forward. Immediately below it, and separated from it in the posterior portion by a dark line, the superior meatus, is the middle turbinated body, appearing as an elongated and somewhat fusiform projection, of a yellowish-red color. Below this again may be seen a considerable portion of the middle meatus, and below this the upper half of the inferior turbinated body, of much the same

color as the middle, and giving the impression of a somewhat elongated mass resting on the floor of the nares. The inferior meatus and floor of the nares cannot be brought into view. If, now, the mirror be turned a little to one side, the eminence surrounding the orifice of the Eustachian tube will be seen separated from the posterior wall of the vault of the pharnyx by the sinus of Rosenmüller. The Eustachian tube is seen in profile and its orifice simply shows a dark line on a bright yellow background, the anterior wall of the depression leading into it.

By changing the inclination of the mirror now to a more obtuse angle, there will be brought into view the dome-like cavity of the vault of the pharynx, presenting a somewhat irregular outline, the surface being marked by furrows and depressions which indicate the site of the pharyngeal tonsil; the parts becoming smoother as the view passes down, until there is seen the deep red, smooth, shining surface of the mucous membrane of the lower pharnyx. In adult life, however, as we know, the glandular structures of the pharyngeal vault undergo a certain amount of atrophy, and hence are not prominently visible. In these cases we simply bring into view the smooth surface of the mucous membrane lining this cavity. This change in the inclination of the mirror is best accomplished by simply turning the handle in the fingers, as the attempt to accomplish it by elevating or depressing the hand is liable to end in causing retching. To obtain a complete inspection of the vault of the pharnyx, it will generally be found best to change the mirror and use one mounted at an angle of 130°, the same used in making a laryngeal examination.

This examination reveals the condition of the mucous membrane of the nasal cavity, the variety and extent of such hypertrophic thickening as may exist in nasal catarrh, the condition of the pharyngeal tonsil, the extent of hypertrophy that may exist there, the character and amount of the secretions from the parts, the existence of tumors in the nose or vault, ulceration, necrosis, etc.

As regards the nasal cavity, not much information is gained by this inspection that cannot be better obtained by anterior rhinoscopy. Morbid conditions of the septum, for instance, I have never seen shown in this way, except the hypertrophy of the mucous membrane on either side posteriorly, as the result of hypertrophic rhinitis. Ocasionally, however, small polypi well up beneath the middle turbinated body posteriorly are seen, where the anterior examination fails to reveal them. The pus discharged from the accessory sinuses can be recognized also in this manner, although usually this is best detected by the anterior examination.

CHAPTER II.

METHODS OF TREATING THE UPPER AIR PASSAGES BY MEANS OF INSTRUMENTS.

In the local treatment of the mucous membrane of the upper air passages, various mechanical devices have been employed by which the parts were thought to be more thoroughly medicated. To this end various forms of brushes, sponge holders, douches, atomizers, etc., were devised, and in the earlier days of laryngoscopy a good deal of importance was attached to their use. I think no one will question, at the present time, that their value was greatly overestimated, and indeed, with our larger knowledge of the physiology and pathology of the mucous membranes of the upper air passages, our dependence upon these various instrumental aids has greatly diminished, and a large majority of them are thrown aside for the simpler methods.

Insufflations.

Snuffs and their application by means of specially devised instruments possess a certain value in the treatment of the upper air passages, and they are used by most physicians. They may be used by auto-insufflation or by special applicators. Pserhofer was among the first to devise a mechanical means of insufflation, and Rauchfuss to suggest an instrument by means of which powders are thrown into the upper air passages. The objection to all such tubes is that they deposit the powders in mass; this, however, is avoided by the insufflator of Ely, which deposits the powder in a smooth thin film, does not pile it on any one part, and carries it throughout the sinuous cavities. Stoerck's insufflator is used in connection with the compressed-air apparatus; the distal point being placed in position to throw the powder in the desired direction, and the instrument connected with the air chamber, pressure on the valve lets on a sudden blast which drives the powder to the spot intended to be reached.

The advantage of powders is their permanency of action; they remain for some time in contact with the part, become slowly dissolved in the mucus, and are absorbed by the membrane. The remedies

usually employed in this form are tannin, bismuth, alum, borax, ferric alum, zinc, nitrate of silver, iodoform, opium, morphine, belladonna, benzoin, sanguinaria, galanga, etc. To reduce the strength of an agent, it may be combined with pulv. cretæ, pulv. acaciæ, magnesiæ carbonas, sacch. alb., etc. If the powder is heavy, it may be rendered lighter by adding powdered starch or lycopodium.

Douches.

Fluids may be thrown against the diseased membrane of the larynx, pharynx, or nasal cavity by means of syringes and douches of different forms. Fig. 15 shows the ordinary post-nasal syringe, a common barrel syringe, fitted with a curved tube which terminates in a rose douche, delivering jets in every direction. For injections through the anterior nares, an ordinary ear syringe answers the purpose very well, but better still is the post-nasal syringe shown above, with the tube straightened.

Fig. 15.—Post-nasal Syringe.

By nasal douche we mean the application of a continuous stream of water through the nasal cavities. The principle on which it acts was first suggested by Weber, who, in conducting a series of experiments on the sensibility of the nasal mucous membrane, observed that when a fluid was introduced into the nasal cavities the soft palate was lifted firmly against the posterior wall of the pharynx, and completely prevented the escape of the fluid into the pharynx. Acting on this idea, Thudicum introduced what is now known as the nasal douche. It consists of a reservoir from the bottom of which leads a rubber tube terminating in a rounded tip shaped to fit into the nostril. This tip being placed in the nostril and the reservoir raised, the head is bent over a bowl as shown in Fig. 16; the fluid then enters one nostril, and, passing around the posterior border of the septum, escapes through the other

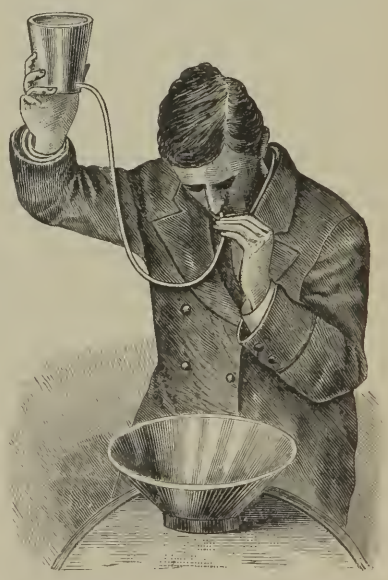

Fig. 16.—Method of Using the Nasal Douche.

in a continuous stream, reaching pretty thoroughly the whole of the mucous membrane of the two chambers.

The value of the douche, as a means of applying cleansing fluids to the nasal cavity in certain cases, cannot be denied, especially in atrophic rhinitis, and perhaps syphilitic necrosis; but in the ordinary chronic inflammation with hypertrophy it is not only of no permanent value but may be mischievous, as first suggested by Roosa, who reported a number of cases of acute otitis media resulting from its use, attributing this accident to the entrance of fluids into the middle ear. I think it is to be borne in mind here that the very large proportion of patients affected by hypertrophic rhinitis of long standing suffer from a mild form of middle-ear disease. This acts as a predisposing cause of the acute form, which probably is precipitated by the use of the douche. Considering this danger, and the fact that the douche accomplishes little if any good in hypertrophic rhinitis, its use in this affection should be condemned unreservedly. There is no such danger in atrophic rhinitis, and I strongly advise the douche in this disease.

Atomizers.

The successful treatment of catarrhal affections being regarded as largely dependent upon the extent to which the parts might be reached by the medicament used, naturally led to the plan of reducing the solutions to a state of fine atomization, that they might be carried into the sinuous passages of the nasal cavities or thrown into the air passages below. In view of the very large extent to which the use of atomizers has grown in late years in the treatment of diseases of the upper air passages, it becomes a matter not only of historical but also of practical interest, to trace their development from the cruder devices of former days to the perfect instruments now provided for our use. The system was first put in practice at certain of the mineral springs of Europe when patients inhaled the spray from minute jets of water projected against the walls of the chambers. Portable atomizers carrying out the same principle followed in due order, and have been modified by a succession of scientists, until finally Dr. Sass, of New York, constructed the atomizing tubes generally known as Sass' tubes. These are made on the Bergson principle, that if a current of air be driven through one tube placed at right angles to a similar tube which leads to a reservoir of water, a vacuum will be created by which the water will be drawn up into the vertical tube, until, meeting the current of air, it is broken up into a fine spray. They are of heavy barometer glass tubing, but instead of the two tubes being placed

at right angles, they are joined together, the upper end of the water tube being bent around at its upper extremity to meet the air current at a right angle. Subsequently these tubes were constructed of hard-rubber and metal. The Sass tubes are now used practically to the exclusion of all other forms of atomizers, the air current being supplied as a rule by some form of pump or by water power. The latest and best atomizing outfit is shown in Fig. 17. It is made by Meyrowitz, of this city.

Much ingenuity has been exercised in the construction of these various devices for atomizing fluids, and it has been a broadly preva-

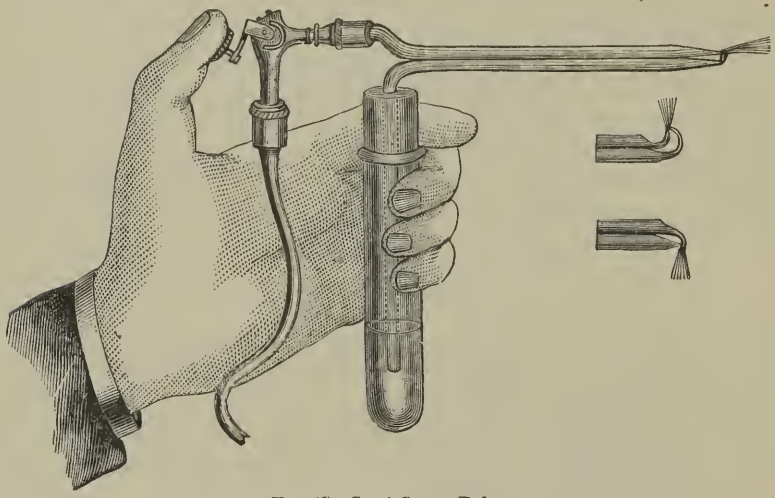

Fig. 17.—Sass' Spray Tube.

lent impression that our success in the treatment of diseases of the upper air passages was largely dependent upon the elaborateness and perfection of our mechanical devices, especially those used for the production of sprays. Pressure of the air by which the fluids are atomized has also been thought of importance, the ground being taken that at a pressure of fifty or sixty pounds atomized fluids come more thoroughly in contact with the membrane lining the sinuous passages of the nose, and are so driven farther down into the bronchial tubes, the idea still being held that local applications constitute the essential element necessary for the cure of catarrhal diseases. This I believe to be an entire mistake. A catarrhal inflammation, as a rule, is not cured by the local application of astringent, alterative, stimulant, or other remedies, as will be more fully elaborated when we come to discuss the particular forms of inflammatory disease met with in the upper air tract. Local applications are undoubtedly useful, but I am

confident that those who place their main reliance on the use of sprays will find themselves disappointed in the results of treatment. All the apparatus necessary for the successful treatment of the ordinary cases which come under our observation may easily be carried

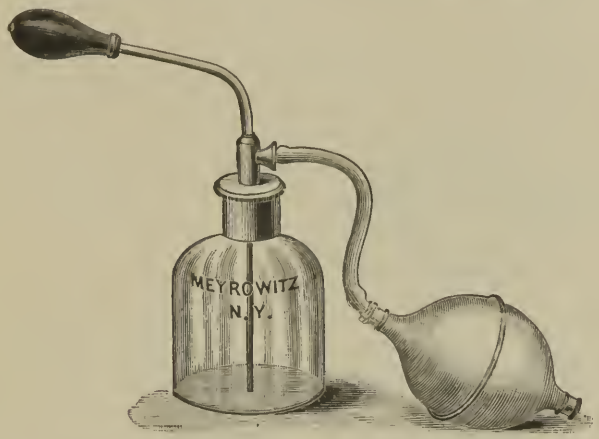

FIG. 18.—The Ordinary Single-Bulb Hand-Ball Atomizer, fitted for Nasal Applications.

in a small handbag. Regarding then, an atomizing apparatus as a very great convenience, although not an absolute essential, it remains to suggest that perhaps the most convenient device is the ordinary Sass tube, constructed of metal, with the air receiver and pump, preferably the water pump if one's office is supplied with the public water service; but this apparatus possesses no notable advantages over the simpler devices. In my own office work, after an experience of many years with various methods of atomization, I have finally arrived at the conclusion that one's work can be quite as well performed, and even much inconvenience avoided, by using an ordinary single-bulb hand-ball atomizer. Of these perhaps the best is that shown in Fig. 18, which is constructed on the principle of Richardson's atomizer. The device shown is fitted with a rounded bulb to adapt it for nasal application, although the same instrument is sup-

FIG. 19.—Delano's Atomizer.

plied with both the laryngeal and post-nasal tip. This instrument is used, in the main, to apply cleansing and disinfecting lotions to the upper air passages, and delivers an abundant yet finely divided spray. For making applications of astringent, sedative, or other medicating solutions, preference should be given to some of the atomizers constructed on the Bergson principle. In Fig. 19 there is shown an atomizer, constructed on this principle, which is sold in the drug stores under the name of Delano's Atomizer. It delivers a very fine spray, the flow of which ceases immediately upon relaxing the pressure upon the bulbs; it is therefore useful in making applications of cocaine, and for this purpose I regard it as of especial value.

Inhalations.

In 1864 Siegle put in practice the plan of using steam as the power by which fluids were atomized in the Bergson tubes. This, however, was not available for a direct application, but could only be used for inhalation, and it is this principle which is made use of in the ordinary steam atomizers sold by the instrument makers at the present day. The principle on which they act is too well known to need remark. The drugs that can be used in the Siegle apparatus include nearly the whole list of astringents, alteratives, etc. In addition to these, there are certain drugs which contain principles which are volatilized when brought in contact with hot water at a temperature of not less than 150°. This list includes carbolic acid, creosote, camphor, oil of tar, tincture of benzoin, tincture of myrrh, oil of eucalyptus, terebene, pine-needle oil, ethereal tincture of iodine, etc. A teaspoonful of any of the above, placed in an open-mouthed bottle or cup containing half a pint of water slightly below the boiling point, is placed beneath the mouth, and the fumes inhaled. In MacKenzie's inhalator, shown in Fig. 20, and instruments of that type, the volatile oils of the mdicament used are driven off more actively by means of a burning lamp placed beneath the reservoir or cup.

Fig. 20.—MacKenzie's Inhalator.

There is a number of drugs which are volatile at the ordinary

temperature, the properties of which, as inhalants, possess a certain amount of value. The method by which these are used varies, but ordinarily is quite simple. A glass or vulcanite tube, into which has been inserted either cotton-wool or sponge, is the ordinary form. The absorbent material is charged with the drug which it is desired to use, and the little tube held either to the nostril or to the mouth, for the purpose of inhaling the fumes. This apparatus is oftentimes of no little use in the later stages of a winter cold or a bronchial

Fig. 21.—Large Globe Inhaler for Inhaling Fluids Atomized by means of Compressed Air.

attack, in stimulating the membrane to freer transpiration, and thereby promoting a resolution of the inflammatory process.

In acute inflammations involving the upper air passages inhalations undoubtedly serve to relieve pain, and perhaps to mitigate the severity of the attack; they add much to comfort by relieving the

irritability of the parts and lessening the severity and frequency of the cough.

On the whole, however, inhalations are to be regarded largely as palliative measures. The elaborate apparatus for inhaling purposes may serve to produce a certain moral effect upon the patient, but I doubt if the action of the drug is not quite as efficacious in the simpler devices suggested above as in the more elaborate inhaler. The steam atomizer, while a somewhat entertaining toy, I have long discarded, because it not only accomplishes little good, but is capable of doing mischief. Especially is this true in all forms of chronic disease of the air passages, as the hot steam so relaxes the parts as to counteract the benefit accomplished by the medicament. Indeed, none of the above methods of inhalation is to be used in chronic affections, unless, it may be the administration of the muriate of ammonia, which oftentimes serves to loosen the thick inspissated mucus of chronic bronchitis.

Cold inhalations, by means of compressed air in the atomizer, have been, in the past few years, largely resorted to in the treatment of chronic affections of the upper air passages. They are administered by directing the spray into one end of a large globe, the patient sitting in front of the opposite end, drawing the atomized fluids into the air passages. The principle of action is that the large particles of atomized fluids are arrested in the globe and fall to the sides, while the finer particles of the spray are carried to the air passages by the inspiratory act. The drugs used in this way embrace nearly the whole list of astringents, alteratives, etc., which are supposed to possess a certain amount of controlling influence on catarrhal processes. This is undoubtedly a valuable method of applying astringent remedies directly to the upper air tract, and in those cases in which the inflammatory process has invaded the larger bronchial tubes its use is attended with better results than any other device which we possess. Certainly, it is far preferable to hot inhalations, either by means of the steam atomizer or the ordinary inhalator. In Fig. 21 is shown one of the more elaborate forms of the globe inhaler.

CHAPTER III.

MUCOUS MEMBRANES.

All cavities inside the body, as the alimentary canal and the air passages, which open directly or indirectly on the surface are lined by soft and moist prolongations of the skin known as *mucous membranes*. These are covered by a layer of cells, known as the epithelium, which are in reality secreting glands to keep the membrane moist and soft. The secreting surface is greatly increased by a folding-in of the membrane upon itself, forming one or more flask-like cavities lined with epithelial cells and called follicular glands or racemose glands.

Fig. 22.—Section of Mucous Membrane, drawn Diagrammatically. *f*, Submucous layer of connective tissue; *d* and *e*, mucous membrane proper, containing blood-vessels, nerves, closed follicles, connective and elastic tissue fibres, and marked by villi; *c*, epithelial layer; *b*, simple follicle; *a*, racemose gland.

This, briefly and simply stated, is the design and function of a mucous membrane, a proper understanding of which is of the greatest importance to the proper appreciation of diseased conditions of the upper air tract.

A mucous membrane is composed of three layers.

First, a superficial layer composed of epithelial cells.

Second, the mucosa proper, a layer composed of white fibrous and yellow connective elastic tissues, embracing within their meshes blood-

vessels, smooth muscular fibres, different varieties of small glands, and presenting minute processes or villi.

Third, a layer of loose connective tissue, the submucous cellular tissue (see Fig. 22), which is composed of a more or less loosely connected network of connective tissue, by which the mucous membrane is attached to the parts beneath, and, of course, allows of a very free play between the membrane and these parts. This fact becomes of extreme importance in connection with acute inflammatory affections of the membrane, as it admits of the effusion of serum into this layer where its attachment is very loose, as in the ary-epiglottic folds of the larynx, the posterior surface of the epiglottis, and the ventricular bands.

Physiology.

The function of a mucous membrane is to afford a soft, moist, and pliable lining to those cavities and passages of the body which communicate with the external world. It is lubricated by a clear fluid mucus, which is poured out upon it by the follicular and racemose glands, whose ducts open upon its surface, and also by the epithelial cells which compose its superficial layer.

Owing to the constant mechanical disturbance to which the membrane is subjected in mastication, speaking, etc., the cells of its superficial layer are being constantly detached and thrown off. In order to compensate for this loss, new cells are being continuously generated from below.

Another physiological characteristic of mucous membranes is their permeability; fluids penetrate them from without, are absorbed by the blood-vessels, and carried into the system. An exception to this rule is found in the fact that the virus of the snake does not permeate mucous membranes, and is in no way absorbed by them, it being neecssary that it should meet with an abraded or cut surface in order to reach the blood-vessels and be taken up by them. The same is true of the syphilitic virus, which is inoculable only through an abrasion of the membrane.

Inflammation of Mucous Membranes.

Inflammation is that series of changes which takes place in any tissue as the result of irritation or of an injury, provided the injury is not of such a character as to completely destroy its vitality. This injury may be a direct irritation of the tissue by a mechanical or chemical agent, or the inflammation may be caused by some microorganism, by syphilitic or tuberculous infection, or by indirect irritation as the result of exposure to cold.

Through the researches and experiments of Cohnheim, Stricker, Burdon-Sanderson, and others, the nature of these changes is well known.

The first effect of an irritation of the tissues is a dilatation of the arteries and veins.

This enlargement of the vessels is attended with an acceleration in the flow of blood, dilatation of the capillaries, an exudation of white corpuscles and serum, constituting the well-known inflammatory effusion, and great alteration in the nutrition of the inflamed part.

This, in brief, completes the picture of inflammation in general. Confining ourselves now to mucous membranes, we find certain peculiarities manifesting themselves in the processes.

Inflammation of mucous membranes occurs in three different varieties: catarrhal, croupous, and diphtheritic.

Catarrhal Inflammation.—This form is by far the most frequently met with. In its milder degrees it is characterized merely by an increased secretion of mucus, the membrane at the same time becoming swollen and reddened, as the result of the increased vascularity. As the inflammatory process becomes more severe, the vascular phenomena are more marked; cell generation is more rapid, and leucocytes and pus corpuscles are poured out in great quantities in the increased exudate. The epithelium also loosens, and falls off more rapidly from the surface of the membrane, under the stimulus of the inflammatory process; and as it progresses we have the mucous discharge gradually becoming a purulent one, from being so highly charged with these unripe cell elements, many of which are virtually pus cells.

The process continuing, its activity, which so far has been largely confined to the superficial layer of the membrane, extends to the subepithelial layer or the mucous membrane proper, and the cell elements here take on renewed activity, and, being rapidly generated, they distend and infiltrate the parts. The membrane becomes thickened and swollen; and there now may occur several secondary manifestations of the inflammatory process. As the result of the loss of surface epithelium, the membrane may become denuded of its epithelial coat, and there may occur an abrasion, or so-called catarrhal ulcer. As the result of the distention and infiltration of the membrane proper, the glands may become so choked that their contents are imprisoned, and, as the result, there is formed a minute abscess, which, breaking and discharging, leaves a small ulcer. The acute process may subside, or it may lapse into the chronic state. In this the increased vascularity subsides to an extent, though the vessels remain permanently somewhat dilated. The cell production, however, goes on both

in the epithelial layer and in the mucous membrane proper; and the increased secretion persists; but all in a somewhat diminished degree.

Chronic catarrh differs from acute catarrh in that in the former the subepithelial layer of the membrane is much more involved. It is thickened and indurated by infiltration and also by a renewed activity in another elemental tissue of the membrane, viz., the connective tissue, which plays an important part in chronic inflammation. This tissue is developed now by a slow process of proliferation, and by its peculiar characteristics gives rise to those features of chronic catarrh which render it extremely obstinate to manage.

Having been once developed, it is probable that connective tissue is never absorbed or excreted as the other cell elements in catarrh; but, becoming organized, it remains a permanent element in the membrane to deform, disorganize, and interfere with its proper function. As the result, then, of the new deposit, the normal thickness of the membrane is increased and its proper function impaired; as in the hypertrophied membrane of the nose, causing nasal stenosis, and thereby interfering with normal nasal breathing. Again the hypertrophied tissue presses upon the glands and follicles of the membrane in such a manner as to cause their atrophy, thus robbing the membrane of its proper supply of lubricating fluid, its mucus, and giving rise to the so-called dry catarrh. It may be deposited about the individual follicles or glands in such a manner as to press upon the outlet alone, thus closing them up, giving rise to small cysts, which, undergoing fatty degeneration, act as a source of renewed irritation and cause a more or less general glandular hypertrophy.

In addition to this we notice a tendency in chronic processes to differentiation, by which in the one case the morbid process expends itself upon the epithelial and lymphoid structures, while in the other case it acts upon the connective-tissue elements of the membrane. Thus, in the former we may have a chronic catarrhal inflammation in which a rapid degeneration of epithelial cells occurs in such a manner as to increase to a very large degree not only their growth, but their loss from the surface, giving rise to a form of secretion from the membrane in which a large amount of mucus is thrown off, heavily surcharged with unripe epithelial cells, causing muco-purulent discharge. Thus, in the purulent rhinitis of children, to be described later, the essential lesion consists in an intense activity in the epithelial structures. Again, we may have the same activity in the lymphoid cells giving rise to a formative inflammation, as it were, in which the lymphoid cells are rapidly generated and remain a portion of the membrane, instead of being thrown off in the form of a purulent

discharge. A lymphoid hypertrophy is the result of this form of catarrhal inflammation, such as is met with in adenoid disease of the vault of the pharynx, or hypertrophy of the faucial tonsil, or enlargement of the follicles of the lower pharynx. Activity of morbid processes confined largely to epithelial and lymphoid structures belongs essentially to the younger period of life, the diseases above referred to, it will be noticed, being all of them diseases of youth and childhood. The morbid activity in the connective-tissue structures, on the other hand, belongs essentially to later life; hence a chronic inflammation of the mucous membrane, resulting in a connective-tissue hypertrophy, such as in hypertrophic rhinitis, is essentially a disease of adult life. This is due probably to the fact that the development and ripening, as it were, of a connective-tissue cell is a process of years, and that a true connective-tissue hypertrophy can exist only after a catarrhal inflammation has been in operation for a long period of time.

Croupous Inflammation.—This form of inflammation is of a higher grade, and of a more intense form than the catarrhal; for, while it commences in the same manner, with distention of the blood-vessels, escape of liquor sanguinis and blood corpuscles, and proliferation of cells, it differs from it in the fact that the exuded liquor sanguinis contains a large amount of fibrin and albumin, which coagulates upon the surface of the membrane and forms a false membrane. This false membrane is of a more or less dense, firm character, and is composed of fibrin, inclosing a large number of epithelial cells in its meshes. At times it may be soft and almost granular in character, so much so that it may be easily removed with a soft brush, coming away in small broken particles. At other times it may be of so dense a character that after removal it can be torn only with considerable force. As a rule it can be easily removed, leaving the membrane beneath it in the main intact, merely deprived of some of its superficial epithelial cells. After removal, the same process may be renewed and a new membrane form, or the parts may be restored to their normal condition.

The favorite site for this form of inflammation is in the upper air passages, the pharynx, tonsils, larynx, and trachea, though it may occur in the bronchi, intestinal canal, and other parts.

Why this form of inflammation occurs, it is impossible to state; but it is not improbable that it is due to some previously existing blood condition, which dominates the inflammatory process, and so far enriches the exuded liquor sanguinis with the fibrinous material that it coagulates on its exposure to the air, and so a false membrane is formed in place of the fluid catarrhal discharge. Further evidence

that this form of inflammation is due to some previous condition in the blood is afforded by the fact that its onset and course are usually marked by a febrile movement, far more aggravated in character than we would expect to find as merely symptomatic of so limited an extent of local inflammation. The temperature in simple membranous sore throat, characterized by a croupous deposit on the tonsil, often ranges as high as 103°–104° F.

Croupous inflammation may manifest itself in a fibrinous exudation on the surface of a mucous membrane, as in croupous laryngitis, or true croup, membranous sore throat, croupous rhinitis, etc.; or the exudation may take place in the follicles of the membrane, giving rise to an acute follicular inflammation such as occurs in the affection generally known as acute follicular tonsillitis, which is a croupous inflammation of the tonsil, in which the exudation takes place in the crypts of the organ rather than upon its surface.

Diphtheritic Inflammation.—This variety of inflammation, again, is characterized by the formation of a false membrane, and also commences as a catarrhal inflammation, with its increased blood flow, cell proliferation, and exudation of liquor sanguinis, the exudation, as in the croupous form, consisting largely of fibrin and albumin; but there is this difference, that while in the croupous form the exudation is poured out upon the surface of the mucous membrane, in the diphtheritic form it permeates and infiltrates its whole thickness, down to the submucous tissues.

This exudation permeates the membrane so densely that in coagulating it completely destroys its vitality, and there results a dead membrane, involving the whole thickness of the mucous membrane. It is removed with considerable difficulty; and in its removal, carrying with it the whole thickness of the membrane, leaves the parts beneath entirely denuded. The false membrane declares itself to the eye as a dead membrane, a genuinely necrosed or sloughing tissue, of a dark grayish color, resembling boiled macaroni; in contradistinction from a croupous membrane, which is of a bluish, pearl-gray color, presenting no appearance of necrosis, but rather of an unmistakably living tissue.

It should be understood, in regard to these terms, croupous and diphtheritic inflammation, that they refer only to forms of inflammation to which mucous membranes are subject, and not to the specific diseases which are spoken of under the names croup and diphtheria; as, for instance, membranous croup is generally understood to be a croupous inflammation of the mucous lining of the larynx, although a better classification would suggest the more expressive and correct name of croupous laryngitis; and also of diphtheria—it is a blood

disease, characterized by a local manifestation in the throat, consisting of an acute inflammation of the mucous membrane, which assumes the diphtheritic form; so that when we speak of croupous and diphtheritic inflammation, we simply define the form which the inflammatory process assumes.

In regard to catarrhal inflammation, or, as it is generally called, catarrh, the same may be said; properly speaking, it means that form of inflammation of a mucous membrane which is characterized by an excessive discharge of mucus or muco-pus; but a better usage in the direction of an exact classification would suggest that the local designation should be prefixed, as nasal, laryngeal, bronchial catarrh, etc.

CHAPTER IV.

TAKING COLD.

If we ask ourselves what special influences produce the morbid changes of the common and familiar phenomenon which we call taking cold, or what is the true relation between the recognized causes and observed effect, we find it somewhat difficult to give a correct answer to the question.

Among the numerous theories advanced may be mentioned that of Rosenthal, who asserts that the immediate effect of cold, acting on the surface of the body, is to excite contraction in the peripheral vessels, by which the blood is driven from the surface in upon the internal organs, and acts there as an irritant, exciting inflammation. This view of the matter scarcely explains the action of cold when membranes near the surface are involved, as in coryza or conjunctivitis. Schenk[1] found that warmth excites a movement in micro-organisms toward a centre of warmth. He arranges ordinary colds into two groups—those due to bacterial infection, and those that are not. In the former, there is a period of incubation; in the latter the disease follows quickly after exposure. When a person exposes himself to cold, the bacteria tend toward his body as a focus of warmth, where under some possible conditions they seem to penetrate the mucous membranes or skin.

Seitz's theory is that disorders resulting from catching cold are due to the removal of heat to an unusual extent from the external or internal surface of the body; that this causes some functional disturbance, which in its turn gives rise to certain morbid processes in some portion of the body, far removed from the part immediately affected by the cold. That the morbid changes are not due to the immediate or direct effect of this exposure is evident from the fact that, as a rule, a certain length of time elapses before these changes set in.

The theory of Seitz, it seems to me, is not complete. The true action of cold upon the body, in producing morbid conditions, is probably on those nutritive changes which are constantly going on,

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[1] Centralblatt für Bacteriologie, July 18th, 1893.

and by which the animal heat is developed. Any marked deviation in the production of heat in the body from the normal standard, as the result of extraneous influences, results in morbid changes. In the ordinary phenomena of "taking cold," we have the results of a low temperature acting on the heat-producing processes, but in an indirect manner. The direct action of the cold is, as a rule, upon the surface of the body, but the resultant morbid condition is upon some organ remote from the exposed part. In both cases, however, the cause and the effect are the same, and the connection between the exposure and the resultant inflammatory condition is the disturbance of those nutritive changes in the tissues which result in the production of animal heat. The nutritive processes going on in the whole economy are governed by the central nervous system, and, furthermore, a certain amount of nervous force is expended in the regulation of these nutritive processes. If, as the result of exposure to cold, these nutritive changes are arrested in a certain portion of the body, the same nervous force being sent out from the central system, it will be understood how this local arrest of the nutritive process in one portion would be attended with a certain amount of increased nutritive activity in another portion; the activity of the nerve centres going on as before. Now, increased nutritive activity constitutes inflammation, and this inflammation locates itself at the point of least resistance, viz., as a rule, at some point in the economy where a mild chronic inflammatory process is going on, which is lighted up into an acute process as the result of a cold. A cold then is contracted from an exposure not of the whole, but of a part of the body, as the result of which the physiological processes of heat production in that part alone are disturbed, giving rise to increased nutritive activity or inflammation in some organ far removed perhaps from the site of the primary exposure. As a matter of clinical observation, we know that colds occur during the spring and fall months, seasons which are characterized by moderately low temperature, but with notable dampness of the atmosphere together with considerable atmospheric motion, or high winds. Hence we recognize that there are three factors usually necessary for the production of "a cold"—low temperature, air in motion, and moisture. It is also necessary, as a rule, that one or more of these factors should act for a somewhat prolonged duration of time. The momentary action of an intense cold, or draught, or moist atmosphere, does not usually result in any morbid changes, but it is only after a somewhat prolonged exposure of the body that the familiar phenomena of a cold ensue. Among the most familiar causes of taking cold may be enumerated sitting in a draught wearing insufficient clothing, insufficiently protected feet, going from

a warm room to a cold room, slight exposure while perspiring, etc. Wearing thin-soled shoes, or insufficiently protected feet, is a very prolific source of trouble; as the loss of heat in this manner is far greater than is usually recognized. Especially is this the case if the soles of the shoes are damp, as the radiation then takes place much more rapidly.

Again, when the body is perspiring, the loss of heat is going on with considerable activity; and we find that even a slight exposure is liable to result in far more serious disturbance than would occur from the same exposure were the body not in an overheated condition. There should, however, be borne in mind this difference: if the perspiration is the result of violent exercise, all the nutritive processes are stimulated to an abnormal activity, animal heat is being generated rapidly, and the perspiration necessarily sets in as a conservative measure, to prevent too great accumulation of heat in the system, but still as the direct consequence of the violent exercise. If now in this condition the body is exposed to the influence of cold, and the perspiration suddenly checked, very serious consequences may ensue. But if, on the other hand, a copious perspiration is brought on by artificial means, while the body is in a state of quiescence, as in the hot room of the Turkish bath, the heat source is from without, the heat-producing forces of the system are not disturbed, and the cold plunge, while of course it suddenly checks the perspiration, does not, as a rule, give rise to any untoward consequence. Moreover, the exposure by the cold plunge is only temporary and of short duration, and by the subsequent manipulation any serious loss of heat which may have resulted is speedily and completely restored.

A swimmer will remain in water at a temperature twenty or thirty degrees below that of the body for a somewhat prolonged period of time; but while in the water he is in a state of constant and laborious activity, thereby setting in play those processes by which animal heat is generated. But even with this constant activity, if the bath becomes too prolonged, there comes a time when the body is unequal to the task of supplying sufficient animal heat to make up for the loss, and the bather succumbs to the direct influence of this tremendous drain upon the system. Here the result is not an inflammatory attack such as usually accompanies an exposure to cold, but on the contrary, there is usually produced great prostration, violent cramps, weakened circulation, intense venous congestion, and in fact, the whole system is robbed of its normal heat, which loss tends to retard all healthy functional activity in the body; whereas the results of an exposure to cold are due to a localized arrest of heat production, and a disturbance of the balance, as it were, by which nutritive

activity goes on in the system. As was said before, the loss of animal heat does not directly produce these morbid changes, but creates or gives rise to certain functional disturbances, with the nature of which we are not entirely acquainted, and these give rise, after a certain interval of time, to the morbid changes which we call taking cold. This interval may be short, lasting perhaps but a few hours, as is usually the case in slighter disorders, or it may be prolonged one or two days, or even more. In this case, as a rule, the resultant disorders are of a more serious character. There is usually attendant upon taking cold fever of a more or less marked character. That this fever is not symptomatic, but an essential fever, is shown by the fact that it stands in no constant relation to the morbid changes which result, as in even slight disorders we may have the febrile motion more marked than the fever which accompanies the more aggravated forms of inflammatory troubles which may rise from a cold. Moreover, the fever usually set in immediately after exposure, and when the later morbid changes appear no increase of fever, as a rule, is detected. The local disorders resulting from an exposure to cold are manifested in any part of the body. Owing to their exposed situation, being the first to receive the current of inspired air, with its impurities, or whatever of irritating qualities it may possess, the upper air passages are perhaps more subject to inflammation than any other portions of the body, and, once having become the seat of morbid changes, there is always a liability to a recurrence of the attack from a slighter exciting cause than that which gave rise to the first attack.

As these attacks recur with increased frequency and gravity, we find that the morbid process localizes itself farther down, and nearer to the vital centres, and finally this liability, so called, to take cold, gives rise to a bronchitis, or some still graver affection, which, fixing itself upon the lungs, may prove far less amenable to treatment than the simple attacks which preceded it, or even lead to the development of those still graver forms of pulmonary disease.

The question is often put to the physician, whether a catarrh will lead to the eventual development of lung disorders; and it seems to me that the answer should be that it may, and that it often does, in the manner above noticed.

This may not occur by absolute extension of the inflammatory process, but there can be no question that an individual suffering from a chronic laryngeal catarrh is far more liable to an attack of tracheitis, and that one suffering from a tracheitis is far more susceptible to a bronchitis than one in whom there exists no catarrhal inflammation; and so on, down to the deeper lung tissues.

As regards this so-called liability to take cold, it should be understood that this, in a large majority of cases, and probably in every case, is due to an existing chronic catarrhal inflammation, of perhaps so mild a type as to give rise to but very trival symptoms, or even pass unnoticed; but still, an existing catarrh, the result probably of a neglected cold; and the renewed attacks to which the individual becomes so liable consist in a lighting up of the old trouble. The existing catarrh finally becomes established as a chronic process.

Prevention of a Cold.—The conditions which give rise to a cold should be avoided, especially by those possessing hereditary tendencies or weaknesses and by those who are liable to take cold. These directions, of course, are more important in the months of the year when we have to the greatest extent the prevalence of a low temperature, moisture, and air in motion; these we find in the spring and fall. Perhaps the most important direction that can be given in regard to preventing colds is as to the proper regulation of the clothing. The body should be sufficiently clothed for warmth and comfort, no less and no more. If too little clothing is worn, there will necessarily result a loss of animal heat. If too much is worn, the body becomes overheated, and perspiration necessarily ensues to reduce the temperature and restore the proper equilibrium, and consequently, as we have before seen, a condition arises in which the body is extremely sensitive, and in which it is especially liable to succumb to the influence of cold or moisture. This rule in regard to clothing the body applies to all parts of it. The mistake should always be avoided of coddling any portion or of leaving any portion insufficiently protected. A very frequent and common error is fallen into by many, of crowding on too much clothing upon those portions of the body which they suppose to be subject to some special weakness; as, for instance, many people, supposing themselves to have weak lungs or throats, fall into the error of piling wrap upon wrap, muffler upon muffler, around their necks and about their chests, thereby encouraging the very condition which they fear, and incurring the risk they desire to avoid; for the excessive muffling of the parts necessarily leads to perspiration, and consequently the danger of its being suddenly checked upon the removal of the wraps. As a rule, when a sore throat comes on, the very first remedy which is adopted is to tie a piece of red flannel about the neck. The only advantage of this procedure lies in a certain amount of counter-irritation, due to the harsh fibre of the flannel rubbing against the skin. Aside from this, there is no possible good to be accomplished. It is put on for a protection; it

simply renders the neck and throat more sensitive, and entails a greater liability to take another cold. Of course, what is said about the neck may be said about any other portion of the body. Perhaps the very worst place in which to wear the so-called chest protectors sold in the drug stores, is on the chest. The chest is infinitely better protected, in one liable to bronchial attacks, by an extra sole worn on the boot than by a felt pad worn across the chest. The whole theory of clothing should be based on the idea that exposure to cold results in an interference with nutrition in some part of the body. Therefore, to prevent taking cold, the clothing should be uniformly distributed over the body, with simply enough of it for comfort, and absolutely no more.

The selection of the proper fabric to be worn next the skin is too often dictated by a consideration of luxury, rather than of health. The most important function that goes on in the skin, is that by which the body is kept at an equable temperature, by means of perspiration. Theoretically, this is accomplished by means of an insensible perspiration, and practically too, except under extraordinary circumstances, when the perspiration becomes profuse. Now this function of perspiration, or heat radiation, takes place best when the fabric next the skin is a thoroughly porous one. We have no fabric comparable to pure wool in this respect. Silk is very objectionable, in that cutaneous transpiration is interfered with. The same is true of cotton and linen. I regard the heat-conducting properties of these different materials as a matter of little moment, compared with the greater importance of wearing next to the skin a thoroughly porous and elastic fabric.

It is the habit to change the thickness of the underwear twice and sometimes even three times during the year, through the varying degrees of cold and heat. This plan is not wise in all cases, and is even a source of mischief. We practically live, during a large portion of our time, in much the same temperature, summer and winter, or, rather, we endeavor to keep our houses during winter at a temperature of about 70° F. I doubt the wisdom of wearing very heavy underwear in rooms so heated, as the necessary consequence is a more or less profuse perspiration. A better plan is to wear the same thickness of underwear throughout the year, while the protection from the extreme cold of winter is supplied by a change in the outer garments.

As before stated, excessive covering should be avoided under all circumstances. This perhaps is a greater error than insufficient protection, although the latter is undoubtedly a frequent source of trouble, especially when the feet are concerned, for, coming in contact,

as they do, with cold floors and pavements, and a wet or damp ground, the loss of heat from the general system by reason of such contact is necessarily rapid, unless the foot is thoroughly well protected by a thick, dry sole to the boot. In our climate, with its sudden and marked changes of temperature, the proper regulation of the clothing becomes a matter of considerable importance, and perhaps of no little difficulty. The hands and face are rarely covered, as a rule, or protected, and yet we never take cold from their exposure. The deduction is obvious: if certain parts of the body may be exposed with impunity, the converse conclusion is suggested, that by keeping our bodies too warmly clad we have thereby engendered a necessity, which possibly might have been avoided with benefit to the health and vigor of the system. The rule may be safely laid down, that, in clothing the body, the trunk and limbs should be made simply comfortable, but never wrapped to the extent of inducing perspiration by the amount of clothing. Hats and caps, being a necessity of modern life, should be light, well-ventilated, and designed to retain as little heat as possible; they should not be too heavy, nor press with too much weight upon the head; the crown should be perforated, to allow of as free circulation of air as possible between the top of the head and crown of the hat, and should be constructed of such material as will allow the escape of heat.

The hair, the natural covering of the head, should not be cut when the removal of so much protection of the head is liable to result in catching cold.

In short, the body in all its parts should be made comfortable. It should not be so clothed as to cause perspiration, nor that chilling can occur. Very much harm is done by the habit of wearing heavy clothing and sitting in overheated rooms. Those who allow themselves to grow into the habit, by which they are comfortable only in a room at 80° F., are simply making hot-house plants of themselves, and are engendering a condition of the system which renders its resisting power very feeble. It is purely a habit, and one easily overcome, not only without risk but with undoubted benefit to the individual, in the increased vigor of body which will result.

In our variable climate, where the daily changes are oftentimes so great, it is a mistake to suppose that we can so regulate our clothing as to protect ourselves from the results of these great changes. We protect ourselves from absolute cold by wearing clothing, but not from taking cold. We protect ourselves from taking cold by so regulating our habits of life as regards clothing, etc., that we expose ourselves to these changes with impunity. In other words, we inure ourselves to the climate. Perhaps we have

no better way of maintaining the functions at the highest point of healthy activity than in the daily use of the cold bath. For those whose physique is equal to it the daily use of the cold plunge or shower bath is to be recommended, as the best protection possible against taking cold. If this is not well borne, it is clearly indicated by the feeling of lassitude and the chilly sensations which will follow the use of the bath; the contrary being indicated by the sense of warmth and general invigoration which attends its use. If the plunge or shower is not tolerated, the cold sponge, either of the whole body or to the waist, is to be commended. The time at which the bath should be used is preferably in the morning, in that not only the night sleep is a better preparation for it, but also the exhilaration and vigor which follow it are an excellent preparation for the labor of the day. The Turkish bath, which has become so deservedly popular in our day, while undoubtedly a luxury, is to be commended with a certain amount of reserve as a preventive, or in the treatment of a cold.

Treatment of a Cold.—It is much to be deprecated, that, as a rule, an ordinary cold is allowed to take its own course without treatment. If a part has once become inflamed and is permitted to undergo resolution without interference, it is left in a weakened condition, which invites renewed attacks from a slight cause; for when the acute inflammatory process subsides, complete resolution does not take place, but there is left a morbid condition, very mild in character perhaps, but nevertheless one of chronic inflammation. This may be so slight as to be scarcely noticeable by the patient, and yet it is this condition which takes on a renewed inflammation from a very slight provoking cause, which oftentimes the patient would escape did it not exist. The ordinary plan of treatment of a cold is so simple, and involves so little trouble, that it is the duty of the physician to urge that all cases, however simple, should be subjected to it.

Remembering the causes, as laid down above, which operate in the production of a cold, the first indication for treatment will be to supply as promptly as possible the deficiency caused by this loss of body heat. If this can be done in the early stages, when the secondary inflammatory process has not progressed, or, better still, before it has set in, viz., during the preliminary febrile stage, the further progress of the disorder may be promptly arrested; this constitutes what we generally call the abortive plan of treatment. The plan consists, in short, of producing copious perspiration; this perspiration, be it remembered, however, is not primarily the object it is desired to attain, but it is simply the evidence that that object has been attained. The condition to be corrected is loss of body heat; the

measures resorted to for this are measures which have a tendency to increase body heat. The evidence that this has been accomplished, viz., the restoration of this heat, or even more, that an excessive heat has been produced, is manifested by the perspiration. If this so-called sweating can be brought on in the early stage, it serves the purpose of arresting the future progress of the trouble and putting an end to the inflammatory process. If it can be brought about early in the progress of the inflammatory stage, the gravity of the attack can be very materially lessened; hence, the earlier this abortive treatment is resorted to, the better the result. The means of accomplishing this is by simple remedies, familiar to all.

A decoction of hot tea, taken at bedtime, with the addition of a foot-bath and a moderate dose of Dover's powder, is all that is necessary; after which the body should be warmly covered in bed, and extreme care exercised to prevent any exposure while the perspiration is going on. If the constitutional symptoms assume a graver form, that is, if the fever seems excessive, and the effect on the general system marked, much benefit will be gained by the administration of ten grains of quinine, in connection with the diaphoresis. It is generally asserted that following a copious perspiration there is danger of contracting additional cold, on leaving the bed in the morning. This probably is a mistake, although the simple precaution should always be taken of allowing the body to cool off gradually before rising, by removing a portion at a time of the bed covering, and also remaining indoors for a few hours after dressing. If, as the result of this treatment, all symptoms disappear, little else is needed, except the exercise of ordinary precaution.

If, however, the inflammatory stage has set in, and the result of the sweat has been simply to modify and not to remove it, other measures, directed to the special locality of the inflammation, should be resorted to. The remedies indicated will be referred to when we come to treat of special diseases. Confinement to the house should be urged in all cases, as of equal if not of greater importance than therapeutic measures, especially if the inflammatory condition shows any possible grave tendencies.

CHAPTER V.

THE ANATOMY OF THE NOSE.

The External Nose.

The external nose, the most prominent feature of the face, is composed of a bony and cartilaginous framework, covered with muscular tissue and integument. The bony portion of the framework is composed of the nasal bones and the nasal processes of the superior maxillæ.

The Nasal Cartilages.—The cartilages are five in number, the two upper and two lower lateral cartilages, often called the alar cartilages, and a single cartilage in the median line, the triangular cartilage of the septum. At the junction of the lateral cartilages with the bony framework, two or three sesamoid or accessory cartilages are ordinarily found. These cartilages are joined to each other and to the bony framework, by articulations which allow of a certain amount of motion.

The Nasal Fossæ.

The nasal passages are composed of two wedge-shaped cavities, extending from the nostrils in front to the posterior nares, by which they communicate with the upper pharynx. The roof of these cavities is narrow, and somewhat arched from before backward, and is composed of the nasal bones in front, the body of the sphenoid behind, and the cribriform plate of the ethmoid between them. The floor is formed by the palatine processes of the superior maxillæ and the palate bones. The two cavities are separated from each other in the median line by the septum, which is composed of the perpendicular plate of the ethmoid above, and the vomer below. Up to the seventh year of life the septum lies in the median line, but after this time there is usually some slight deviation to one or the other side, not, however, enough to encroach in any degree upon the breathing-space. The outer wall of each cavity is formed by the superior maxillary, lachrymal, palate, and sphenoid bones, and is traversed antero-posteriorly by three scroll-shaped bones, commonly called the turbinated.

The lower turbinated bone is a very thin lamella of osseous tissue, curled upon itself, which is attached to a slight horizontal ridge presenting on the outer wall of the cavity.

The middle turbinated bone belongs really to the ethmoid, and hence it is sometimes called the lower ethmoidal turbinated. It consists of a broad, thin plate of bone, passes downward, and is curled upon itself in the same manner as the lower turbinated.

The superior turbinated is small. In its posterior portion it is

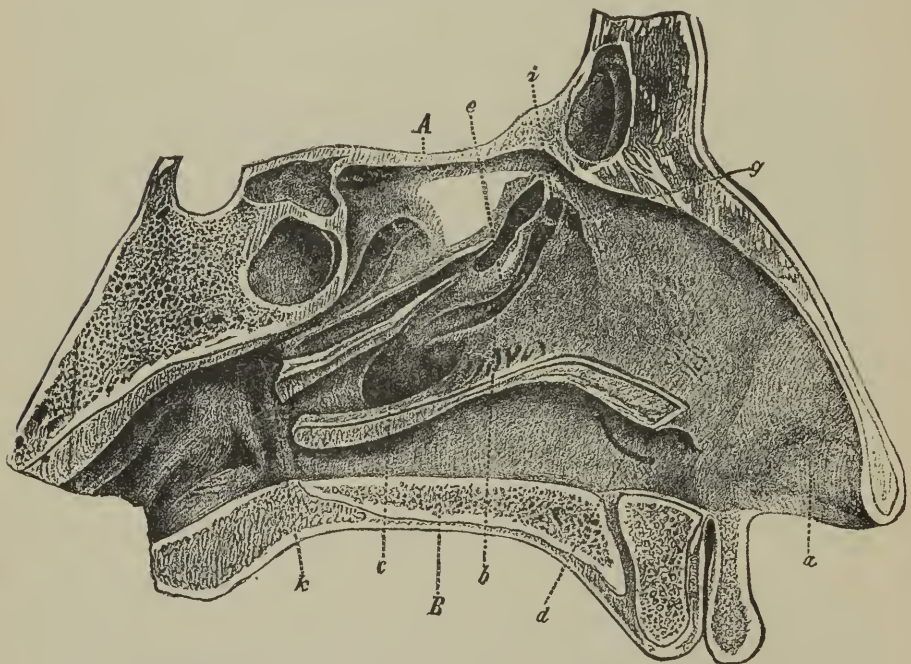

FIG. 23.—Outer Wall of Left Nasal Cavity, the Inferior and Middle Turbinated Bones having been Removed. (Zuckerkandl.) *A*, Roof of nose; *B*, floor of nose; *b*, hiatus semilunaris and ostium maxillare; *c*, portion of outer wall of nose encroaching upon cavity of antrum; *d*, opening of lachrymal canal; *e*, bulla ethmoidalis; *g*, small canal between anterior insertion of middle turbinated and the ethmoidal cells; *i*, ostium frontale; *k*, furrow forming boundary between the nasal and naso-pharyngeal cavities.

entirely distinct from the middle turbinated bone, but anteriorly is merged with it.

These turbinated bones are nearly parallel with one another, and divide each cavity into three passages—the lower, the middle, and the superior meatus.

In the anterior third of the lower meatus, below the lower turbinated bone, is found the opening of the lachrymal duct.

Beneath the middle turbinated is to be found the opening into

the antrum of Highmore. It is in the middle meatus that we find the openings into the maxillary and accessory sinuses, as well as into the anterior ethmoidal cells.

Above the middle turbinated bone we find the superior meatus, of chief interest from the fact that into it open the posterior ethmoidal cells and the sphenoidal sinus, by means of the recessus ethmoidalis. This small opening lies in the very posterior part of the superior meatus, and when a fourth turbinated bone is present is situated immediately behind this.

The Accessory Sinuses.

Communicating with each nasal fossa are four cavities, usually designated as the accessory sinuses. These are the maxillary, frontal, sphenoidal, and ethmoidal sinuses.

The Antrum.—The maxillary sinus, or antrum of Highmore, the largest of these accessory cavities, is a pyramidal-shaped cavity, hollowed out of the body of the superior maxilla and varying in size in different persons.

The Frontal Sinuses.—The frontal sinuses are two triangular-shaped cavities, which lie between the two tables of the frontal bone, the floor being formed by the roof of the orbit. They are absent in childhood, but become developed in adult life. They communicate with the nares through the infundibulum, a rounded opening in the anterior extremity of the hiatus semilunaris. Occasionally these sinuses are entirely absent. As a rule, they are separated from one another, but more frequently than in any other of the accessory sinuses a normal opening exists from one side to the other, and in still rarer instances an opening is found between the frontal sinus and the orbit, or between this cavity and ethmoidal sinuses.

The Sphenoidal Sinuses.—The sphenoidal sinuses are two comparatively large rounded cavities hollowed out of the body of the sphenoid bone, and are separated from each other by a thin lamella of bone or septum. They communicate with the nares by a small opening into the superior meatus. These sinuses are also occasionally absent, their places being filled by solid bone. Zuckerkandl has also found in rare instances, instead of two lateral sinuses, a horizontal plate dividing the cavity, in which case the upper cavity opened directly into the ethmoidal cells, the lower opening into the nasal fossa. A still rarer anomaly is that in which the anterior wall is entirely wanting, the cells opening directly into the ethmoidal sinuses.

The Ethmoidal Sinuses.—The ethmoidal sinuses differ from all the other accessory cavities, in that, instead of being large hollow

cavities, they are composed of a large number of small cells, separated from each other by thin lamellæ of bone. They divide themselves naturally into two groups, the anterior and the posterior ethmoidal cells; the anterior opening into the nasal cavity in the hiatus semilunaris by means of small openings called the ostia ethmoidalia, while the posterior group opens into the superior meatus. The ethmoidal cells are less definite in their boundaries than any of the others, as they may extend either into the sphenoidal cells posteriorly, or into the frontal sinuses. Again, we may have an abnormal opening into the orbital cavity, in consequence of which emphysema of the orbit may occur.

The mucous membrane lining these sinuses is continuous with, and differs in no marked degree from, that lining the nasal cavities, unless we note that in the maxillary sinuses the membrane is thrown into folds by a sort of redundancy of tissue, as it were.

The Mucous Membrane.

The mucous membrane lining the nasal cavities is continuous with that of the pharynx, and extends into the Eustachian tubes and the accessory cavities. Its superficial layer is composed of columnar epithelium in the upper portion of the cavities, as low as the middle turbinated bones, and the upper third of the septum. The remaining portion of the lining membrane is endowed with columnar ciliated epithelium, although, according to some writers, the epithelium is also ciliated in some portions of the olfactory tract. This fact becomes of some importance in connection with those diseases of the cavity which act to destroy or impair the vibratory motion of the ciliæ, as this function undoubtedly has an influence in promoting the movement of the mucus and facilitating its discharge; hence, therefore, its abolition increases the tendency to an accumulation of the discharges in diseased conditions. The muciparous glands are usually of the tubular variety.

In addition to the muciparous glands, we find in the olfactory region (that part above the middle turbinated bones) tubular glands which, from the name of their discoverer, are called Bowman's glands.

In that portion of the nose immediately within the nostril, called the vestibule, we find the mucous membrane largely endowed with vascular papillæ and covered with squamous epithelium, in fact so closely resembling the integument that, as Moldenhauer observes, it is really to be regarded as a process of the skin.

We find, also, in this locality a number of stiff hairs, termed vibrissæ, whose object is merely to purify the inspired air.

The Nerves.—The innervation of the nasal mucous membrane has its source in the olfactory nerve, together with the nasal branch of the ophthalmic, the superior maxillary branches of the trigeminus, and filaments from Meckel's ganglion. The olfacory nerve supplies the nasal cavity with the special sense of smell. This nerve arises by three roots, which unite in a flat band which passes forward along the base of the brain until it reaches the upper surface of the ethmoid plate. Here it is expanded into the olfactory bulb, from which fifteen to eighteen branches are given off on either side and are distributed to the mucous membrane covering the superior and middle turbinated bones and the upper third of the septum. They terminate in minute thread-like filaments, which pass to the surface of the membrane, between the epithelial cells. In the continuity of this filament, before it reaches the surface, there is found a minute bulb-like expansion, the olfactory cell, as shown in Fig. 24.

FIG. 24.—The Olfactory Cells in Man. (Max Schultze.)

The nasal nerve, arising from the ophthalmic division of the trigeminus, on entering the nose divides into two branches: an internal, which supplies the mucous membrane near the anterior part of the septum, and an external, which, descending in a groove on the inner surface of the nasal bone, and sending a few filaments to the mucous membrane as far down as the lower turbinated, becomes cutaneous at the junction of the upper lateral cartilage with the nasal bone, and furnishes cutaneous sensibility to the tip of the nose.

The branches of the anterior dental nerve supplying the mucous membrane are distributed to the inferior meatus and inferior turbinated bone.

The branches from Meckel's ganglion enter the nasal cavity through the spheno-palatine foramen. One of these branches forms a communication with the anterior dental nerve within the antrum, giving rise to the so-called ganglion of Bochdelek. The naso-palatine branch passes forward across the roof of the nose, and runs obliquely downward and forward, along the lower part of the septum, and pierces the hard palate through the anterior palatine foramen, joining the anterior palatine nerve.

We thus find the mucous membrane endowed with general sensation through the same nerve trunk as that by which vasomotor control is exercised, namely through the fifth nerve. This peculiar anatomical characteristic in the nasal mucous membrane has been very largely made use of to substantiate the various theories as

regards the causation of hay fever, asthma, and other so-called reflex neuroses. I question if these theories rest on any well-substantiated grounds as yet.

Blood-Vessels.—The vascular supply of the nasal fossæ is derived from the anterior and posterior ethmoidal arteries, branches of the ophthalmic, which supply the ethmoidal cells, frontal sinuses, and roof of the nose; the spheno-palatine, from the internal maxillary artery, distributed to the mucous membrane covering the spongy bones and the septum; and the alveolar branch, from the internal maxillary artery, supplying the lining membrane of the antrum.

The Turbinated Bodies.

In addition, however, to the parts already described, there are found *beneath* the surface of the mucous membrane, on the faces of the lower and middle turbinated bones, large plexuses of blood-vessels, the turbinated bodies, which have figured so extensively in our literature of the last fifteen years, and have been the subject of so much speculation and discussion. This mass of blood-vessels was recognized by anatomists in the last century, but in a vague and somewhat indefinite way.

Zuckerkandl describes the mucous membrane covering the turbinated bones as consisting of connective tissue, the upper surface covered with flat epithelium, the deep layer forming the periosteum of the turbinated bones. Between these two layers we have abundant lymph tissue, and possibly lymph glands, although these have not been definitely made out. The tissue covering the turbinated bones is studded here and there with tubular mucous glands, many of which extend completely through to the periosteum. Within this lymphoid structure we have abundant venous plexuses to which he gives the the name "Schwellkörper" (swell bodies). About the venous plexuses the unstriped muscular fibre is abundantly distributed. The definite localization of the venous plexuses serves to distinguish this tissue from true erectile tissue, such as is found in the corpora cavernosa of the penis. The arterial supply is derived from the spheno-palatine artery. The capillaries are divided into three sets, one set being distributed to the periosteum, the second to the glands, the third to the surface. The capillaries distributed to the surface form loops which empty into the veins, together with the superficial gland capillaries. The deeper gland capillaries, and these distributed to the periosteum, pass into the veins, forming the so-called Schwellkörper, and the blood is then conveyed by venous channels in the periosteal surface of the membrane to five distinct plexuses, one going to the veins

of the face, the second to the veins of the cranium, the third to the orbit, the fourth to the soft palate, and the fifth to the hard palate. These Schwellkörper are distributed according to Bresgen as follows: one over the lower turbinated body, one along the border of the middle turbinated body, and one at the posterior extremity of each of the turbinated bodies.

FIG. 25.—Section of the Cavernous or Erectile Tissue of the Middle and Lower Turbinated Bones, Inflated and Dried. × 2 diameters. (Bigelow.)

We find, therefore, the nasal cavity containing this most intricate and delicate apparatus, which is designed to subserve the function of serous exudation. The special method by which this serous transudation takes place we are scarcely ready to describe. Chatellier suggests that certain minute canals which run at right angles to the mucous membrane, penetrating to the lymph channels, serve the purpose of serous channels. The question arises, whether Chatellier's canals may not be the tubular mucous glands of Zuckerkandl.

CHAPTER VI.

THE PHYSIOLOGY OF THE NOSE.

The nose performs a threefold function in the economy. It is the organ which presides over the sense of smell; it gives a certain character and resonance to the voice; and it has a special duty to perform in connection with respiration.

The Sense of Smell.

Odorous particles present in the inspired air, passing through the lower nasal chambers, diffuse into the upper chambers, and falling on the olfactory epithelium produce sensory impulses, which, ascending to the brain, give rise to the sensations of smell. It is presumed that the sensory impulses are originated by the contact of the odorous particles with the rod-shaped olfactory cells of Max Schultze. We are still in the dark on this point, though we have every reason to believe that any stimulus applied to the olfactory nerves will produce the sensation of smell, but the proof is not so clear as in the case of the optic and auditory nerves. We know that the olfactory membrane is the only part of the body in which odors as such can give rise to sensations and the sensations to which they give rise are always those of smell. Apparently the larger the olfactory surface the more intense the sensation; animals with acute scent have a proportionately large area of olfactory membrane. On the other hand, it has been disputed that the olfactory nerve is the nerve of smell. Cases have been reported of persons who appeared to have a sense of smell and yet in whom the olfactory lobes, after death, were absent.

There is one fact in this connection of which we may be certain, that the appreciation by the olfactory nerve of odorous particles requires a healthy condition of the nerve, a healthy membrane, and a patulous cavity. That olfaction is accomplished entirely by the olfactory nerve has been amply demonstrated by physiological experiment, and is further shown in the fact that the nerve and the olfactory bulb are very largely developed in those animals in which the sense of smell is unusually acute.

The general sensibility of the membrane is derived from the branches of the trifacial, already described. The sense of smell is intimately associated with the sense of taste, in that the loss of olfaction is always attended by more or less complete loss of the sense of taste. This is explained by the fact that the special sense of taste is supplied to the tongue from the glosso-pharyngeal nerve and perhaps the gustatory, and really consists in the appreciation of either the acid, bitter, sweet, or saline character of substances applied to it, and nothing more. The nicer appreciation of flavors is entirely the result of impressions made on the terminal filaments of the olfactory nerve.

The Function of the Nose in Phonation.

The nasal cavity performs a most essential part in voice production—it is *the* resonance chamber *par excellence*. It is upon the correct use of the soft palate by which this chamber is opened or closed from behind, and the condition and patency of the nasal passages, that the "timbre" or quality of the singing as well as the speaking voice depends. It is in this cavity that the original tone produced in the larynx is most powerfully reinforced and its overtones developed. Any thickening of the mucous membrane or stoppage of the posterior or anterior nares gives to the voice that peculiar and disagreeable quality known as "nasal twang." Moreover, in such conditions articulation is fatiguing and the voice soon breaks down with any effort requiring prolonged use, the whole difficulty disappearing, as a rule, upon the removal of the obstructing conditions in the nose.

The Function of the Nose in Respiration.

The respiratory and phonatory functions of the nose are too often looked upon as secondary to that of olfaction, a mistaken view, for the nasal passages contain an exceedingly important apparatus connected with the function of respiration, and one on whose normal functional activity depends the integrity of the whole of the mucous membrane of the respiratory tract below.

The real importance of the nose in respiration was first recognized by Vierordt, who, I think, was the earliest to emphasize the important fact that the air is raised in temperature in passing through the nasal chambers.

While this function of the nose in later years occasioned more or less comment, it is really only within a comparatively recent date that it has received the attention it deserved. Flint in 1876 alludes to the fact that the air is moistened in the upper respiratory

tract, and Rosenthal in 1880 claims that air is already warmed and saturated when it reaches the alveoli.

In a paper on this subject in 1885[1] I gave certain views entertained in regard to the respiratory function of the nasal chambers, which were based largely on clinical observation and which were practically the following:

The normal function of the mucous membrane being to secrete mucus, and only in amount sufficient to keep the membrane in a soft, moist, and pliable condition, any excess of this amount becomes a morbid secretion. Robbed of a small portion of its ninety-three per cent of water, it becomes thick, inspissated, and unhealthy. Every breath of air that passes through the nasal chambers, and reaches the passages below, must become surcharged with moisture, otherwise it would rapidly injure the mucous membrane of the air passages beyond by robbing them of their moisture, and so rendering their mucus thick and inspissated. If the humidity of the inspired air be compared with that of the expired air, it will be found that, in addition to the other changes as regards carbonic acid and oxygen, the inspired air will have gained five thousand grains of water. I think I am safe in saying that if five thousand grains of water were extracted from the mucous membrane of the bronchial tubes and air cells in the course of twenty-four hours, the result would be complete destruction of their function, to such an abnormally dry condition would they be reduced; for, as we know, in each act of respiration, the inspired air reaches only the larger bronchial tubes, and the source of moisture, therefore, of the inspiratory current cannot be from the smaller bronchial tubes or air cells. We are, therefore, forced to the conclusion that this surplus of five thousand grains is taken up by the inspiratory current during its passage through the nasal chambers, and is still retained by it as it makes its way out through the air-passages, for the only source from which this amount of water could be taken up is the nasal mucous membrane. The mucous membrane of the lower air passages is endowed with no especial apparatus for the secretion of water; the only secretory apparatus with which it is endowed is in the mucous glands, which secrete mucus alone.

In the nasal mucous membrane, however, we find an apparatus capable of furnishing this water, and this is the so-called erectile tissue of the turbinated bodies. It is absolutely necessary and essential, for the integrity of the lower air passages, that the air which

[1] "Hay Fever, Asthma, and Allied Affections," N. Y. Med. Jour., April 24th and May 1st, 1886.

reaches them should be so far charged with moisture that they should not be robbed of any of their secretion. Especially is this true in a variable climate like ours, in which so great changes occur, characterized by excessive humidity or absolute dryness of the atmosphere.

The great function then of the nasal chambers is to so prepare the ingoing current of air that it shall exercise no injurious influence on the mucous membrane of the passages below. The nose as a respiratory organ becomes infinitely more important to us than as an olfactory organ.

The mechanism by which the water is poured out into the nasal chambers, and the ingoing current thus surcharged with moisture, is in this so-called erectile tissue. The watery constituents of the blood transude the mucous membrane, and appear on the tortuous surfaces and passages of the cavity. Nature to meet the great demand has furnished the membrane in this region with such an abundant supply of large tortuous vessels that they assume the appearance of erectile tissue, and thus have given rise to this erroneous idea as to their function, suggested by the name erectile tissue. The vasomotor system of nerves so delicately regulates this function that the transudation of serum accurately adapts itself to every existing atmospheric condition, so that when the air is saturated with moisture no serum escapes, when the atmosphere is dry the turbinated vessels are charged with blood and the serum is poured out in amount sufficient to saturate the ingoing air with moisture, without impairing the consistence of the blood in the vessels. This control is so delicately exercised as to meet even momentary changes in the humidity of the inspired air, and it is readily seen, therefore, how easily any impairment of this delicate mechanism may occur.

These views were based on the result of many years of clinical observation of this membrane, both in health and disease.

Since my views were first published, they have been confirmed in a very striking manner by Aschenbrandt's exhaustive experiments, which show conclusively that the warming of the air in respiration is done exclusively by the nose.

Experiments were also made as to the amount of moisture in the expired air. He found that each five litres (five and a quarter quarts) of expired air contained 0.18 gramme (2.77 grs.) of water, which constitutes complete saturation, and furthermore, that the whole amount withdrawn from the body in twenty-four hours was 500 grammes (7,715 grs.), and that the source of this, therefore, was in the nose. A still further conclusion was drawn from these experiments, that all mechanical dust is completely arrested during inspiration, and is deposited on the moist surfaces of the nasal membrane.

Subsequent to Aschenbrandt's observations, Kayser made a series of investigations in the same line; eliminating certain sources of error in the former's experiments; his results were practically the same.

Kayser also performed a series of experiments for the purpose of finding how much the air was warmed in oral breathing, and found that the air was heated almost half a degree less than in passing through both nostrils.

As a result of further experiments he found that in its passage through the nose or mouth, the air was completely saturated with moisture.

The above experiments, as originally suggested by Aschenbrandt, were intended to approximate, as nearly as possible, the conditions of normal respiration, the tidal air being taken as five hundred cubic centimetres, and the respiration rate as twenty. In thirty seconds, then, five litres (five and a quarter quarts) of air would pass through the respiratory passages. Kayser points out that at least half the time is consumed by expiration and repose, and consequently in the experiment the air has been allowed to remain in the nose and mouth at least twice as long as it does in normal respiration. He, therefore, repeated all of the above experiments, regulating the aspirator so that five litres (five and a quarter quarts) would pass in fifteen seconds instead of thirty seconds. He found, however, that this increased rapidity did not notably influence the result, either with reference to temperature or saturation.

He also found that lowering the temperature of the air before aspiration made considerable difference in the temperature of the air after aspiration, and that doubling the rate of aspiration also exerted an influence upon the temperature and moisture of the air after aspiration.

As a result of further experience as to the filtering out of mechanical dust in its passage through the nose, Kayser proved that the nose is not a perfect filter for mechanical dust. Wurz and Lermoyez hold that the nasal mucus not only serves to arrest the irritating particles in the atmosphere, but that it plays a much more important rôle by destroying the vitality of a large number of pathogenic bacteria.

Kayser makes the further observation that when cold air is inspired through the nose, there is a notably increased blood supply in the turbinated bodies, thereby increasing their heating capacity. In this connection he suggests that in tracheotomy the inspired air in summer must be of a temperature of 30° (86° F.) to 35° C. (95° F.), and in winter of 25° (77° F.) to 28° C. (82.4° F.), and in each case must be saturated with moisture in order not to produce bronchial

irritation; the reason being that the bronchial membrane is not endowed with a special apparatus for moistening and heating the air.

It will be noticed that Kayser makes no definite statement as to the amount of moisture poured out by the venous sinuses of the nose in the twenty-four hours. Aschenbrandt, however, makes the statement that the whole quantity of water, which the air in respiration draws from the human body, amounts to about 500 grammes (7,715 grs.) in the twenty-four hours, and this is taken from the mucous membrane of the nose. This observation was scarcely necessary, since the amount given in my original paper, from twelve to sixteen ounces, is the amount given by all physiologists as being taken from the lungs. Both Aschenbrandt and Kayser, however, make the definite statement that all the air which passes to the lungs through the nose is in a state of saturation. Of course, saturated air passing in and out of the lungs takes absolutely no moisture from the bronchial mucous membrane. The general accuracy of these results has received still further confirmation in a series of experiments by Bloch, who reaches, practically, the same conclusions as Aschenbrandt and Kayser, with the exceptions that he finds that the expired air reaches only to two-thirds of the saturation point, and that the heating capacity of the oral cavity is inconsiderable. Clinical observation, I think, should add sufficient weight to the accuracy of the earlier experiments to practically establish the truth of their teaching.

The proposition is proved beyond question, as previously stated by myself, that the sole source of moisture is in the nose. I think we may declare it as an established truth, that the function of the so-called erectile bodies is serous transudation, and that they are designed to subserve no other function in the economy.

CHAPTER VII.

GENERAL CONSIDERATIONS CONCERNING CATARRHAL DISEASES.

There are so many misconceptions in regard to what is ordinarily called "nasal catarrh," not only among the laity, but also among professional men, that it seems wise here to discuss in a general way certain questions connected with this subject. Perhaps the most prevalent misconception in regard to nasal catarrh is that it is a special disease of the nasal cavity, which leads ultimately to ulceration of the soft parts with necrosis of bone. This view is the one largely encouraged in the advertisements of proprietary remedies for the cure of this affection. It scarcely needs to be stated here that a simple catarrhal inflammation is always a catarrhal inflammation from its onset, and never results in anything more than a simple hypertrophy of the tissues. Ulceration and necrosis belong to syphilis or some other of the constitutional dyscrasiæ alone, and bear no relation whatever to the inflammatory process. Another somewhat prevalent idea, entertained both by the medical men and the laity, is that there is a catarrhal diathesis, a peculiar systemic condition, under the influence of which a patient becomes especially liable to catarrhal inflammation, which may attack indifferently any of the mucous membranes of the body. Patients frequently state that all their mucous membranes are weak, and that an inflammation of the mucous membrane, say of the air tract, is liable to be followed by a similar weakness of the intestinal tract, or possibly of the genito-urinary tract. I know of no good ground for this assertion. Certainly my own clinical experience fails to justify this view in any manner. The mucous membranes of different portions of the air tract are in exceedingly close sympathy, and a morbid process in one portion is very liable to be followed by a morbid process in another, but that there is any sympathy or connection between the mucous membrane of the air tract and the mucous membrane of the food tract I do not believe.

There are many who honestly entertain, and many who, for commercial purposes, dishonestly encourage the idea that a simple

catarrhal inflammation of the upper air tract has a tendency to lead to the development of pulmonary diseases. Possibly a patient with a family history of phthisis is more liable to fall a victim to this disease with a bad chronic catarrhal affection of the upper air passages, than if his upper air passages were in a state of perfect health, and yet even this assertion it would be difficult to establish on any grounds of clear, clinical observation. The tendency of a catarrhal inflammation is to extend downward, but it remains a catarrhal inflammation always. The worst outlook, therefore, is in the development of a chronic bronchitis with asthma, excluding cases of purely nervous asthma, which, while undoubtedly dependent on a rhinitis or naso-pharyngeal catarrh, are not directly the result of it, but occur only in connection with the peculiar neurotic habit. This question, however, is more fully discussed in the chapter devoted to the subject of asthma.

With reference to the use of the term catarrh as describing a special disease of the nasal tract alone, I have rejected it entirely, and in place of it have adopted that nomenclature which designates the character of the inflammation and the region involved, and simply regard catarrh as a symptom of any of the many diseases which may affect the upper air tract.

A very prevalent idea in regard to catarrhal inflammation is that its prominent symptom is excessive secretion, either of normal mucus or of muco-pus. This is rather a nice question to determine in hypertrophic rhinitis. It is altogether probable that this apparent excessive secretion is really a diminished secretion. In health the nose secretes probably a pint of serum, which, becoming mingled with the normal mucous secretion, disappears, without the patient being conscious of it, by evaporation, the water being taken up largely by the inspired current of air. In diseased conditions the amount of serous exudation is not infrequently diminished as the result of hypertrophy, and therefore the mucous secretion, not being diluted with this large amount of serum, becomes thick and inspissated. A pint of healthy sero-mucus, secreted by a healthy membrane, does not make itself felt. Diminish the serous exudation one-half, and we have seven or eight ounces of secretion, from which the limited amount of water is taken up rapidly; hence we find an inspissated mucous which makes itself felt and gives rise to unpleasant symptoms. In atrophic rhinitis the exosmosis of serum is more or less completely abolished. The whole secretion of the mucous membrane is confined to a mucus largely surcharged with epithelial cells, giving rise to a muco-purulent discharge, which is dried up by the ingoing current of air, resulting in the formation of

masses of dried mucus or crusts. We have here a very marked diminution of secretion, and yet apparently an excess, in that every portion of the limited secretion manifests itself in the form of green crusts, which give rise to unpleasant symptoms. In a naso-pharyngeal catarrh we have an apparent excess of secretion. The vault of the pharynx contains in health glands whose function is to pour out mucus for lubricating the bolus of food and thus facilitate its passage to the stomach. The normal secretion from this region in health is large, but it is a thin fluid, and passes into the pharynx in even large quantities without the individual being conscious of it. In a diseased condition of the naso-pharynx, the secretion becomes impaired, and undoubtedly notably diminished, certainly in its watery constituents. It is changed into a muco-pus, which, while apparently secreted in large quantities, remains a thick tenacious mass of mucus adhering to the mucous membrane lining the pharyngeal vault in such a manner that the patient expels it with the greatest difficulty; and hence its presence becomes a source of exceeding great annoyance. The same I think we may say of the larynx and trachea in simple chronic laryngitis and tracheitis, which I regard as affections almost invariably secondary to diseases of the nasal passages. The tract above failing to do its proper duty of warming and moistening the inspired air, the parts below are subjected to the influence of an abnormally dry current of air in respiration, under the action of which the normal mucus is robbed of a certain proportion of its watery constituents, and, becoming thick and inspissated, proves a source of irritation, and is expelled with a certain amount of difficulty. These diseases are not characterized by an excess but by a diminution of secretion, and it is an entire mistake to regard excessive secretion as the prominent feature of a chronic catarrhal inflammation. A proper appreciation of these diseases will be better obtained, I think, when we clearly understand in just what manner a chronic inflammation interferes with the very important functions which these parts are designed to subserve. This question is more fully discussed in a later chapter. I have tried to make clear that a nasal catarrh, so-called, means nothing more than that there is some diseased condition of the nasal passages. In treating such a case our first duty is to make a careful examination of those passages to determine what special morbid condition exists there to give rise to such symptoms as present. A discharge from the nose anteriorly is somewhat uncommon. We should understand that in what is called an ordinary catarrh, viz., a liability to cold with more or less obstruction to nasal respiration, together with a tendency to accumulation of thick mucus in the fauces, we have to do, usually,

with either hypertrophic rhinitis or a naso-pharyngeal catarrh, and these are not infrequently complicated with a deformity of the nasal septum. We have here the three prominent conditions which give rise to an ordinary mucous catarrh, so-called. They are somewhat intimately associated in most cases, and it is by no means easy to determine just where the morbid lesion lies. Certainly the nasal cavity and naso-pharynx react upon each other in a very intimate manner. I am disposed to think that in most cases a naso-pharyngeal catarrh is dependent primarily on hypertrophic rhinitis, and that an attempt to deal with it is unsuccessful until the hypertrophic rhinitis is brought under control. Furthermore, the hypertrophic rhinitis in the large majority of instances is dependent upon a deformity of the septum. We have here, therefore, two lesions to remove before we can successfully attack the naso-pharynx. Moreover, it is by no means easy to recognize by the closest rhinoscopic inspection what constitutes the morbid lesion in a naso-pharyngeal catarrh. Hence we are compelled to remove the disease of the nasal passages first, in order to determine that the naso-pharyngeal disorder is not entirely dependent upon the nasal. These questions are mainly suggested here as illustrating some difficulties in diagnosis, and of course will be discussed at length in the chapters devoted to their consideration. It may be noted that the idea that a hypertrophic rhinitis gives rise to discharge from the nostril is entirely a mistaken one. It is altogether probable that the perverted mucus which accompanies the disease makes its way largely into the pharynx, and we thus find that a faucial catarrh, often spoken of as a pharyngitis, follicular disease of the pharynx, sore throat, etc., is really a disease of the nasal cavities, and in most instances of the mucous membrane covering the turbinated bones.

The character of the discharge, whether anteriorly through the nostrils, or through the posterior nares and the fauces, is always something of an indication of the form of disease with which we have to deal. A purely watery discharge usually indicates a vasomotor disturbance, such as hay fever or nasal rhinorrhœa. A profuse sero-mucous discharge in which the serum is more or less charged with flakes of grayish mucus, is characteristic of nasal polypi. It also occurs in the second stage of acute rhinitis. A thick mucous discharge containing flocculi of whitish mucus, and rendered opaque by a moderate mixture of young cells, may occur in connection with hypertrophic rhinitis, but is usually indicative of a disease of the naso-pharynx. This occurs more especially in young children suffering from adenoid vegetations of the pharyngeal vault. A thick whitish mucus discharged into the fauces, which is drawn down by a nasal

screatus and expelled by hawking, is characteristic of either hypertrophic rhinitis or naso-pharyngeal catarrh. A purulent discharge composed of masses of somewhat thick yellow pus, attended with something of an odor, should always call attention to the probability of the existence of suppurative disease of one of the accessory sinuses, usually the antrum in an adult. A similar form of discharge occurs in the purulent rhinitis of childhood and in the last stages of acute rhinitis. A purulent discharge through the nostrils, mixed with shreds of necrotic tissue and blood, and also with offensive crusts, indicates the existence of ulceration and probable necrosis, and should always suggest syphilis, although small crusts detached from just within the margin of the nostril may be discharged from slight erosions of the septum. The discharge of greenish crusts, in connection with fairly healthy-looking pus, or muco-pus, in connection with a mild offensive odor, the crusts being bright yellow or greenish in color, and containing neither blood nor necrotic tissue, should suggest the existence of atrophic rhinitis.

CHAPTER VIII.

ACUTE RHINITIS.

Acute rhinitis is an acute inflammation of the mucous membrane lining the nasal cavities proper, which may confine itself entirely to these passages or extend to the pharynx, larynx, and the air passages below, and to a lesser degree to the accessory cavities and the Eustachian tube. These parts, however, are not usually involved in the earlier attacks of acute rhinitis.

Etiology.—It is ordinarily stated that an acute rhinitis is the result of exposure to cold and this is undoubtedly true, but behind this is a very prominent predisposing cause in an already existing chronic inflammation of the nasal mucous membrane, which renders the patient especially liable to the occurrence of an exacerbation on slight exposure. It is often stated that cold in the head may arise from the inhalation of acrid vapors, and also that it occurs as the result of a peculiar idosyncrasy which renders the nasal mucous membrane particularly susceptible to certain odors, such as ipecac and iodine. I am disposed to question whether such attacks are true rhinitis; I am rather disposed to think them a temporary disturbance of the great respiratory function of the nose, giving rise to what has been called an influenza, or what in its aggravated form constitutes hay fever or rose-cold; these affections give rise to a morbid condition of the nasal mucous membrane which differs essentially from an acute rhinitis. Under the same category I should be inclined to place those rare epidemics which are recorded in history as having affected large portions of the population where they prevailed, such as that described by Anglade, in which an entire army was suddenly prostrated with the disease; or the great epidemic of 1762, in which the type of the disease was so severe as to cause a mortality of two per cent. It should also be borne in mind that the internal administration of iodides is liable to produce nasal symptoms closely resembling those of acute rhinitis, which, however are not attended with any observable constitutional symptoms. Moreover, its action is limited to the production of turgescence of the blood-

vessels with watery discharges. Iodism runs much the same course as an ordinary attack of acute idiopathic rhinitis.

Symptomatology.—The attack is usually preceded by chilly sensations, by lassitude and general malaise, followed by a mild febrile condition, pains in the muscles, and loss of appetite. These symptoms are not, as a rule, so well marked as the sense of stuffiness about the frontal region, with burning or prickling sensation in the nose. This lasts some hours and is followed by an acrid, and later by a mucous discharge, which soon becomes purulent in character. The dryness of the membrane, which characterizes the onset of the attack, is coincident with the stage of congestion and arrest of secretion which mark the commencement of any acute inflammation of a mucous membrane. The nasal cavity proper is up to this stage the seat of most of the symptoms, which are a sense of discomfort referable to the nose, increased secretion, a sense of fulness or closure of the passages, and frequent and often distressing attacks of sneezing. If the frontal sinuses are involved, the attack is attended with frontal headache. Necessarily this is not due to an extension of the inflammatory process, but to the congestion of the mucous membrane lining the cavity, with pressure upon the nerves. In many cases there is marked irritation of the conjunctiva.

The orifice of the antrum of Highmore is often closed, a somewhat grave condition, to be discussed in a subsequent chapter.

Obstruction of the Eustachian tube, with deafness and ringing in the ears, is not an unusual symptom, but is due to obstruction and not to extension of the inflammatory action, although it may extend to the middle ear.

The extension of the inflammatory process to the accessory cavities seldom occurs; the pharyngeal vault, however, is often involved, the membrane being in a state of mild acute inflammation, the mucous membrane swollen, and the pharyngeal tonsil stimulated to an excessive activity. This is further aggravated by the fact that their normal function is interfered with, for, during an attack of acute rhinitis, the normal mucous secretion becomes thick, viscid, and inspissated, accumulates in the pharyngeal vault and hinders the normal function of the palate; it prevents the renewal of air in the middle ear, obstructs the orifice of the Eustachian tube, and gives rise to marked faucial irritation.

The sense of taste and smell is usually lost for a time. The integument about the orifices of the nostrils becomes inflamed from the discharge, aggravated by the frequent use of the handkerchief.

Diagnosis.—An inspection in the first stage shows the mucous membrane of the turbinated bones red and swollen, while the surface

of the membrane presents a dry and somewhat glazed appearance. The nasal cavity is, of course, largely encroached upon by the swollen membrane, and a deep inspection, therefore, is not easily obtained. In the second stage, the membrane shows a brighter, more rose-colored tint, while its surface is bathed in a profuse discharge of clear, white, watery serum; the membrane seems less swollen and less highly distended.

In the third stage a still further change is noted. The secretion assumes a bright yellow color, is less in amount, and of a thick viscid character. The membrane beneath still presents the appearances of active acute inflammation, and the lumen of the cavity is greatly encroached upon.

Posterior rhinoscopy shows each posterior naris more or less completely blocked by the swollen membrane of the lower and middle turbinated bones, their gross appearance on inspection corresponding to that of the membrane seen in front, in the different stages of the disease. The vault of the pharynx contains a mass of thick, yellow, inspissated mucus, adhering to the crypts of the pharyngeal tonsil, while the membrane surrounding the Eustachian orifice is reddened, but rarely swollen. The lower pharynx oftentimes presents a dry, glazed appearance, due to mouth breathing from obstruction of the nasal passages. It may be somewhat reddened but is not, as a rule, in a state of active inflammation, not being a part of the air passages. Acute as well as chronic inflammation of the regions confines itself to the physiologically associated tracts, and in extending down it passes immediately from the nasal passages to the larynx and trachea.

When the latter are involved, they present the same appearances as are found in ordinary subacute catarrhal inflammation of these regions.

Prognosis.—The prognosis in this disease is favorable. It involves no danger to life and will run its course, as a rule, in about seven days without interference, leaving behind it probably, however, an aggravation of the chronic condition which undoubtedly underlies and is the most prominent predisposing cause of the acute inflammation.

It is understood, of course, that this statement applies to those cases in which the accessory sinuses are not involved, and in which there are no aural complications.

Prophylaxis.—Those who are especially liable to take cold should exercise additional carefulness in the avoidance of those causes which experience teaches them may give rise to an attack of acute rhinitis. Yet an excessive zeal in this direction is always to be avoided, for muffling the head and neck with too much covering invariably leads

to an oversensitiveness of the parts. It must be borne in mind that exposure to low temperature alone is not sufficient to produce a cold. It is a draught of damp air, usually of a mild temperature, which causes the mischief. We do not protect the throat by wrapping the neck; we weaken it. There are few measures of greater value as a preventive of colds than the daily use of a cold plunge bath. This not only acts to keep the emunctory functions of the skin in a healthy state of activity, but also serves to harden the parts and render them less susceptible to the action of cold. It is, however, a measure that we cannot recommend in all cases, and if the cold plunge is not feasible, sponging the body with cold water to the waist every morning is a measure of undoubted benefit. Of more importance still as a preventive measure is the removal of that condition which predisposes to acute rhinitis, namely a chronic rhinitis. Perhaps no fact has been more noticeable in my practice than the rarity with which patients take cold after commencing treatment for a chronic rhinitis, even the slight improvement secured by one or two applications being sufficient to control this tendency. Too much stress cannot be laid on the fact that in all cases the habit of taking cold means a chronic rhinitis, although this may be of so mild a character as to give rise to no marked symptoms, other than this special susceptibility to cold.

Treatment.—An attack of acute rhinitis may often be aborted if measures are resorted to sufficiently early. This must needs be done very soon after the first local symptoms appear, and, as a rule, before the discharge of watery serum which marks the second stage of the attack. From five to ten grains of quinine, followed by some warm drink, such as chamomile tea, or a hot lemonade, with the addition perhaps of a hot footbath will often arrest the attack. If there is frontal pain or facial neuralgia, ten grains of Dover's powder may be given with advantage. A popular measure to break up a cold is the Turkish bath. A Turkish bath is a luxury in health, but I question its efficacy as a remedial agent in acute rhinitis, not to mention the danger of exposure on leaving the bathing establishment after the profuse perspiration. This danger is obviated and the good effect of a hot bath secured by following the excellent suggestion of Cohen, who recommends that the patient be given a hot-air bath immediately before retiring, by wrapping himself in a warm flannel sheet and sitting in a chair under which an alcohol lamp is placed. The bath should last from fifteen to twenty minutes. A profuse perspiration is usually the result, and the patient should then wrap himself in the same blanket and retire to his couch. Some warm drink should be taken immediately after the bath.

The early administration of opium presents a remedy of undoubted efficacy in mitigating the severity of the attack and oftentimes in completely aborting it. This measure, which belonged to the practice of the olden times, receives the indorsement of Mackenzie, who gives preference to the use of the tincture of opium, advising its administration in doses of from five to seven drops on an empty stomach, to be repeated, if necessary, at the end of from six to eight hours. Lees expresses preference for bromide of potassium with belladonna, administered to the extent of producing dryness of the fauces. Beverley Robinson advises the use of a powder of belladonna (grs. xx.) and morphine (grs. ij.), to be thrown into the nose at intervals of three or four hours by an insufflator. Both Sajous and Robinson advise small quantities of tincture of aconite, in combination with some form of opium, when the fever is unusually high.

A very common procedure among physicians is to confine their patients with a cold in the head to their rooms or even to their bed. I am by no means sure that this is wise in all cases. Confinement to the house should be enjoined during inclement weather, but even in the height of an acute rhinitis I have frequently seen benefit from a brisk walk in the open air in the middle of the day, when the sky is clear and the air not too cold. Confinement to bed is unnecessary, unless the constitutional symptoms are aggravated, or serious complications threaten involvement of the accessory sinuses or an attack of middle-ear disease.

The foregoing suggestions are made as specially indicated in the first stage of the disease, and before the discharges have set in, with the idea of arresting the further progress of the attack. In the later stages of the disease we have to deal with the vexatious element of excessive secretion, together with the nasal stenosis.

In the latter stage astringents may be exhibited, such as tannin and zinc, but in my opinion they are of very little use in diminishing the excessive discharge which characterizes the later stages of the disease. If nitrate of silver be used, its better administration would be in the proportion of two grains to the ounce incorporated with talc. Michael, of Hamburg, advises the use of this drug in the strength of one part in twenty. Inhalations of benzoin, lupulin, oil of tar, creosote, oil of pine, turpentine, camphor, etc., may also be used. A homely but convenient method of inhalation is to place from one to four teaspoonfuls of any of the above drugs in an open-mouthed bottle, or even in an ordinary coffee cup, and pour over it half a pint of water of about the temperature of 160° F. This being held near the face, the vapor of it is drawn in through the nose, or, if that is impossible, drawn through the mouth and expelled through the nose. The

fumes of chloride of ammonium have, for a long time, enjoyed a well-deserved popularity, not only in the cases under consideration, but in all catarrhal affections of the respiratory tract. Their action, as I conceive it, is not to diminish secretion or limit the catarrhal process, but to stimulate the membrane to a certain extent; to dilute, as it were, the mucous discharge, and render its expulsion easier.

While these remedies possess unquestioned value in the treatment of this disease, in cocaine we have a remedy whose action is definite and absolutely certain in controlling what is probably the most distressing feature of the attack, namely, the venous turgescence. The peculiar action of cocaine on the blood-vessels has already been referred to and need not be entered upon here, but the promptness and certainty with which the blood from the mucous membrane is expelled upon its application, whether in a normal state or in a state of inflammation, are absolute. This action, however, of cocaine, lasts but three or four hours, when it is followed by relaxation of the blood-vessels, not by a reaction, as has been claimed by many writers. The question arises, then, how far may we depend upon this drug to permanently control acute inflammation of the nasal membrane when it is administered every four hours? My own experience teaches me that when the action of cocaine has exhausted itself, the blood-vessels do not return to their original highly distended condition; so that, if in an acute rhinitis we repeat the application of cocaine as soon as the patient experiences any sensation of recurring stenosis, we may eventually curtail the duration of the attack, if we do not completely arrest it and keep it under control. In cocaine, then, I believe we possses a remedy whose value cannot or should not be questioned, and the efficacy of which is far greater than that of any other single drug, and probably than those above-mentioned combined.

A favorite method of administration is as follows:

℞ Cocainæ hydrochlor., ... grs. xx.
Morphinæ, ... grs. ij.
Aquæ, ... ʒ i.
Ft. solutio et adde,
Cosmolini liquid., ... ℥ i.

This is to be used in the Burgess atomizer. The above prescription makes an excellent and nearly permanent emulsion, though, before using, it is well that the atomizer should be thoroughly shaken. An objection to the fluid cosmoline ordinarily sold by druggists is that it contains a considerable amount of the volatile oils of petroleum, notably the kerosene, which gives a rather unpleasant odor and taste to the mixture. A preferable oil, but one not generally in the mar-

ket, is the Voschano oil, which, I believe, is the Russian petroleum product.

The immediate effect of this application is exceedingly agreeable and pleasant, and, if its use is continued, an ordinary cold in the head may be rapidly brought under control.

If the above mixture and apparatus are not available, an ordinary watery solution of cocaine acts as an excellent substitute. It is well, however, in applying the watery solution of cocaine, to bear in mind that, when the nose is in a highly sensitive state, its reaction is mildly acid. This may produce an unpleasant effect; hence a sufficient amount of bicarbonate of soda should always be added to render the solution alkaline.

As a matter of convenience, cocaine may be given in the form of a powder, although it is doubtful if any snuff reaches the parts with the same degree of thoroughness as a fluid. An excellent formula for this is:

℞ Cocainæ hydrochlorat., ... grs. x.
Pulv. magnesiæ, ... ʒ ss.

Camphor is a popular remedy, and is a valuable adjuvant in the relief of acute coryza, if well diluted and used in a small quantity. Several serious accidents have been reported from its indiscriminate use. The above formula may be used with the addition of three grains of powdered camphor.

The various preparations of mint form both an agreeable and efficacious remedy in catarrhal affections of the nose.

After the vascular plethora has been brought somewhat under control, and the profuse serous exudation has diminished, I find it an excellent practice to make an application of chromic acid directly to the swollen membrane. This is done, not with the idea of destroying tissue, but, in the method described fully in the chapter on hypertrophic rhinitis, as affording us one of our most effective remedies for directly controlling an inflammatory process. The membrane having been thoroughly contracted with cocaine, and cleansed by repeated wiping with pledgets of cotton, one or two small crystals of chromic acid are applied to the face of the mucous membrane covering the lower turbinated bone, making a small eschar, whose office is to pin down the swollen membrane and prevent a return of blood to the part. This may seem a somewhat irrational mode of procedure, and yet it is one which, if deftly accomplished, will often secure results of a most gratifying character. If this measure fails and we find that, after the cauterization, the membrane swells to its original contour, we shall have done more harm than good by our efforts; hence exceeding great care should be exercised that

the tissues be thoroughly contracted before the acid is applied, and, furthermore, that the caustic should be so laid on as to burn deeply into the membrane over a limited area, rather than spread broadly over its surface.

Before closing, mention should be made of the great value of dry heat applied externally over the forehead. A nice way of accomplishing this is by means of the small hot-water bags sold in the drug stores, which can be bound upon the forehead and allowed to remain *in situ* for several hours at a time. The relief to the frontal headache and to the sense of distention or fulness across the root of the nose is often very striking, while at the same time the inflammatory action is probably modified to an appreciable degree.

The remedy suggested by Woakes for the controlling of neuralgic pain accompanying the disease may well be resorted to in cases in which the usual narcotics either fail of their action or are not well tolerated. He recommends that gelsemium be given in the form of the tincture, in doses of ten minims each, to be repeated every three hours until relief is obtained. A more potent remedy and an exceedingly agreeable one is aconitine, which may be given in doses of one-two-hundredth of a grain every three hours, care being taken to note the occurrence of the peculiar prickling of the fauces, with numbness of the tongue or extremities, which indicate the limit of toleration of the drug.

If, during the course of the attack, symptoms should appear of threatened involvement of one of the accessory sinuses, resort must be had to measures of a most active character to prevent so serious an accident. These consist mainly in the moderate use of anodynes and active counter-irritation, with local blood-letting. If the frontal sinus or the antrum of Highmore is in danger, dry cupping immediately over the part should be resorted to, and if this fails of relief no hesitation should be felt in immediately applying a blister. At the same time it will be found that the application of water to the nasal chambers, as hot as can conveniently be borne, will aid much in arresting this serious complication. This is usually accomplished by the ordinary fountain syringe, additional hot water being added to the reservoir as the flow is established through the nares.

Schech advises the use of leeches to the root of the nose in these cases. This local blood-letting is accomplished without involving the temporary disfigurement which attends the blister or cupping, but I question if it is as efficacious.

If inflammation of the middle ear is threatened, vesicating collodion may be applied in front of the tragus, but a more effectual remedy probably in this case would be in the use of leeches, in addi-

tion. Politzeration, as recommended by Woakes, may be resorted to, although this measure should be used with the greatest caution. Schech further recommends incision of the membrana tympani, although Buck questions the advisability of this, when the morbid process is of a simple catarrhal nature, on the ground that the incision speedily closes, and, furthermore, while open it may admit of the entrance of disease germs. The warm douche, of course, should be freely used in the external ear.

CHAPTER IX.

HYPERTROPHIC RHINITIS.

This is a chronic inflammation of the mucous membrane lining the nasal cavities, characterized by a permanent dilatation of the blood-vessels, with increased thickening of the intravascular tissues, as a result of which the normal lumen of the nasal passages is so far encroached upon as to interfere with free nasal respiration. In addition to this, and what is of still more serious import, the respiratory function of the pituitary membrane is seriously affected and the mucous membrane lining the air passages below is subjected to such abnormal conditions as lead ultimately to the development of secondary inflammatory processes in this region.

Probably in no single disorder of the upper air passages is a thorough understanding of its causes, development, and symptoms more important than in the one under consideration, for, as I firmly believe, a morbid process setting in primarily in the nasal mucous membrane is the cause of a large number of secondary affections involving not only the air passages below, but also organs having no especial physiological or regional connection with the nose.

Etiology.—Taking cold figures in medical literature as a probable cause of most of the acute inflammatory diseases of the upper air passages, and chronic inflammation is said to be the result of repeated attacks of acute inflammation. My own belief, however, is that the chronic inflammation sets in first, and that repeated attacks of acute inflammation become the prominent features of the chronic morbid process.

Climatic conditions also are said to exercise an unfavorable influence on the development of catarrhal diseases. But I do not think that climate is an important factor in the production or causation of nasal catarrh, and I will content myself with the statement that climatic influences on catarrhal process are temporary only, whether in improving or in causing an aggravation of the trouble. I have no disposition to underestimate the value of a change of climate, but I think we are never justified in giving hope that it is going to afford anything but temporary relief in ordinary catarrhal disease of the

upper air passages. In those cases, however, in which the disease has given rise to a severe laryngitis or a bronchitis, a change of residence to a more favorable climate often becomes imperative.

Catarrh is often designated as an American disease, and without stopping to question the truth of this assertion search has been made for some peculiar quality of our climate which has given rise to the universal affliction. I think it is very doubtful if the American people suffer more generally from catarrhal disorders than those living in the same latitudes on the other side of the ocean. Certainly the general assertion is a somewhat loose one, not based on careful observation. I believe the origin of this mistaken view to be largely due to the fact that diseases of the nasal cavities engaged the earlier and more industrious attention of specialists in this country than in Europe, and a survey of our literature would naturally lead to the conclusion that nasal disease was exceedingly common here.

The assertion is also made, in searching for a cause of American catarrh, that it is due to our dry and dust-laden atmosphere.

My own experience teaches me in this connection that, whereas a dust-laden atmosphere may be a source of discomfort and irritation to the nasal passages, yet as an efficient factor in the production of organic changes in the deep tissues of the membrane it is greatly overestimated. We have no reason for saying that workers in tobacco or carpet factories, or in mines, suffer as a rule from nasal disease; workers in coal mines inhale the dust of coal to such an extent that the lung tissue itself is oftentimes stained with the carbon, yet this occurs without involving these delicate structures in serious danger. When we consider the far greater vulnerability of these tissues than the tissues affected when the dust enters the nasal cavities, the fact referred to would seem to go far toward establishing the view that a dust-laden atmosphere is comparatively harmless to the mucous lining of the upper air tract.

As regards the influence of tobacco on catarrhal diseases, I can only repeat here what I stated in a former work: "The progress of the chronic pharyngitis is marked, of course, by repeated acute attacks of ordinary sore throat. The use of tobacco is very generally supposed to produce and aggravate chronic pharyngitis. Tobacco smoke is without question an irritant to the mucous membrane of the air passages, especially if inhaled in a concentrated form. On the other hand, it is also true that the mucous linings easily become inured to the action of the smoke, so that breathing or inhaling an atmosphere charged moderately with it is tolerated with immunity. Cubans are, perhaps, among our most inveterate smokers, and yet they suffer somewhat rarely from throat catarrhs.

"I do not wish to say that the use of tobacco may not exercise an injurious influence on the throat, but that this is the result of the direct contact of the smoke with the membrane I regard as very improbable. The effect of smoking in producing gastric disturbance, as shown in the various forms of dyspepsia with which excessive smokers suffer, and this, in turn, leading to the aggravation of an existing pharyngeal catarrh, would seem to me to present the true explanation of the injurious action of the habit on the throat. And so, while I condemn the use of tobacco as a vicious habit, and assert that its excessive use may exert a very injurious influence upon the throat, I wish it to be understood that I consider the pernicious influence an indirect one, and not due to the contact of the smoke with the mucous lining of the upper air passages."

The question of diathetic conditions, as influencing catarrhal disorders, figures largely in our older literature, many writers even asserting that there exists a true catarrhal diathesis. My own observation leads me to the conclusion that catarrhal diseases of any mucous membrane are largely local in character, and that any constitutional disturbance which accompanies them is secondary in character. Certainly I have never met with any case which seemed to me to present evidence of a catarrhal diathesis.

How far the rheumatic or gouty habit may influence catarrhal processes is an exceedingly nice question to decide. Rheumatic or gouty pharyngitis is undoubtedly met with, but the pharynx, as I believe, has no physiological connection with the breathing apparatus. Catarrhal inflammation of the nose due to the gouty or rheumatic diathesis I have not met with.

The graver dyscrasiæ, such as have been called the tuberculous and scrofulous diatheses, undoubtedly exert a predisposing influence to catarrhal diseases, if we use this term in the sense of an unhealthy or excessive discharge from the nasal passages. It is doubtful, however, if they ever lead to the production of connective-tissue hyperplasia, the prominent condition which obtains in the disease under consideration. Their influence is, then, to aggravate the symptoms of an existing catarrhal inflammation, and perhaps hasten the hypertrophic process, rather than a clearly causative influence in the development of the inflammatory action.

By far the most frequent cause of hypertrophic rhinitis, I believe, is deformity of the nasal septum, giving rise to nasal stenosis, and occurring usually in the anterior portion of the passage. Its method of development is, to a certain extent, mechanical, and may be explained as follows: During infancy or childhood, as we know, the cartilages and bones of the nose are soft, and especially subject to

injury. The child has a fall and strikes, naturally, the most prominent feature of the face; or again, in childhood or youth a blow on the nose is one of the most frequent accidents. In many cases the accident gives rise to noticeable symptoms; in a far larger number of cases, however, the injury causes mere temporary discomfort, the symptoms pass away, and the accident probably is forgotten. Now, in the case of fracture with resulting deflection of the septum, the symptoms may develop with considerable rapidity, whereas, in other cases, a mild deformity takes place, and a low grade of inflammation sets in, which becomes extensive as time lapses. In every case, however, the effect is a stenosis of the nasal cavity. The immediate result of stenosis is a gradually developing permanent hyperæmia or distention of the blood-vessels, which not only causes hypertrophic changes, but is followed by a certain amount of shrinking, as it were, in the tissues; not the atrophy which we meet with in atrophic rhinitis, but a bloodless condition of the vessels due to abolition of function. The result of hyperæmia, of course, is to increase nutrition, and we have, as a consequence, true hypertrophy taking place, a permanent structural thickening of the membrane.

The point which I endeavor to make, that traumatism is the original cause of so large a proportion of these cases of hypertrophic rhinitis, is, I think, an exceedingly important one, and I repeat again that an essential point of this theory is the fact that the injury itself antedates the morbid symptoms, oftentimes many years, and that the development is essentially an exceedingly slow process.

Deformities and deflections of the septum are by no means the only cause of nasal stenosis. Any deformity which causes narrowing of the nostril, will produce the same train of symptoms. A displacement of the triangular cartilage of the septum I have seen act in the same manner. Weakness of the dilator muscles of the nostril also, although rarely, is a very efficient factor in the production of hypertrophic rhinitis. Deformity of the alar cartilages, by which the normal aperture of the nostril is narrowed, we occasionally meet with acting in the same way. Not infrequently we find cases in which hypertrophy has taken place without any mechanical stenosis; these may be attributed to taking cold, for, while undoubtedly the habit of taking cold is due primarily in these cases to the chronic inflammation, which in the majority of instances is caused by deflected septum, we must acknowledge that repeated attacks of acute inflammation may precede the chronic process.

Symptomatology.—The prominent symptoms resulting from this condition are due primarily to changes in the normal secretion of mucus. As we have already learned in the chapter on the physiology

of the nose, the secretion in health consists of a limited amount of mucus together with a very large amount, a pint or more, of serum, whose source is in the venous sinuses in the deep layer of the membrane. Now, the deposit of connective tissue in the intervascular tissues, giving rise to notable thickening, necessarily results in an obstruction to this exosmotic process. The amount of serum which transudes is diminished, while at the same time the blood-vessels, not being unloaded by normal transudation, become distended. The discharge from the nose itself, instead of being a sero-fluid mucus, becomes thick and inspissated. The sero-mucus, which in health makes its way into the fauces and disappears, now shows a tendency to lodge in the nasal chambers, or, flowing back into the posterior part of the lower meatus, is hawked back by a sort of nasal screatus into the pharynx.

There is no tendency whatever to the formation of crusts, or inspissated masses, nor do fœtid and offensive secretions accompany this form of catarrhal disease. If such symptoms are present, they should always be regarded as evidence that some other form of disease is to be dealt with.

The popular fear in regard to nasal catarrh is that sooner or later it will result in offensive discharges. This is based partly on the teaching of irregular practitioners that catarrh, so-called, leads to ulceration and necrosis. Ulceration and necrosis belong in no possible manner to hypertrophic rhinitis, but are met only in connection with syphilis, scrofula, and other grave diseases. This theory of offensive discharges occurring in this disease is based also on the teaching that atrophic rhinitis is a later stage of hypertrophic. It is, I believe, based on absolutely incorrect clinical observation, as the two diseases are, from the commencement, totally separate and distinct in character, as will be shown when we come to the discussion of atrophic rhinitis. The fœtid odor met with in connection with hypertrophic rhinitis, I have been able in every case to trace to the mouth. The patient sleeping with the mouth open, the tongue became dry and furred, and the thick velvety epithelium on its dorsum was the source of slightly offensive odor, which persisted for some hours, perhaps, after arising in the morning. Or it may be traced to the existence of decayed teeth, amalgam fillings in the teeth, etc.

Nasal stenosis with mouth breathing is always a prominent symptom of the disease. Mouth breathing is often considered to be a habit, but is probably a necessity due to the fact that the individual cannot get air enough through the nose, and hence is compelled to open the mouth.

In consequence of the impairment of the normal function of the

nose, under which the exudation of serum is interfered with, we soon have certain changes setting in in the air passages beyond. The first to become affected is the vault of the pharynx; the normal secretion of mucus in the pharyngeal vault becomes thick and inspissated, and adheres to the parts in a thick tenacious plug, which hangs down behind the velum of the palate, causing excessive annoyance and oftentimes distress to the patient. During waking hours this is not so noticeable, on account of the voluntary efforts of the patient in clearing the nose and fauces. During sleep, however, this pharyngeal mucus accumulates in a large mass, the removal of which in the morning occasions a considerable effort to the sufferer.

Furthermore, the pharynx becomes excessively irritable, and the hawking and coughing in the morning is often attended with retching and vomiting.

This faucial accumulation is usually spoken of as naso-pharyngeal, or post-nasal catarrh. In very many cases, however, we can undoubtedly trace its development to a previously existing disease of the nasal passages proper, in the manner above outlined. That it is met with, however, as an independent disease cannot be questioned, but even in such a case there is still an intimate pathological connection between the two regions, under which they naturally react, the one upon the other.

Catarrhal inflammation of the lower pharynx does not occur in connection with rhinitis, but we not infrequently find the scattered follicles along the surface of the pharynx enlarged and inflamed, together with the chain of glands immediately behind each pillar of the fauces. This follicular enlargement is probably entirely the result of the nasal disorder. It gives rise, however, to no marked symptoms, as a rule, except in nervous, hysterical female patients. As the disease progresses, we find the larynx, trachea, and air passages beyond involved in a mild catarrhal process. This is not due to any extension of disease from the nasal passages, but is due to the same cause which gave rise to the pharyngeal symptoms, and follows very soon upon their appearance. The air, reaching the larynx and trachea in an abnormally dry condition, robs the mucous secretion in these organs of its moisture and renders it thick and inspissated. Its fluidity being destroyed, it adheres closely to the membrane and gives rise to irritation and subsequently to a mild inflammation. As this secondary laryngitis and tracheitis sets in, we find a rather curious development of the disease occurring. Heretofore the patient, as the result of exposure, suffered from cold in the head. Now his colds result in a laryngitis or bronchitis, which, running a somewhat slow and persistent course, seems to travel upward. A cold in the

head sets in oftentimes days after a bronchitis or a winter cold. This is not the rule, but is of very frequent occurrence. Why it should be so, I do not pretend to explain. Certainly it is not due to the fact of any improvement in the nasal condition, for that is progressive so long as it is allowed to go on without treatment.

Elongated uvula not infrequently occurs in connection with chronic rhinitis, and probably is a direct result of the faucial irritation set up in the later stages of the disease.

Cough also is not infrequently present, and oftentimes constitutes an exceedingly troublesome symptom. This may be present during acute exacerbations only, or it may complicate the chronic affection. It is often referred to as a reflex cough due to intranasal disease. I do not think it necessary to bring in this obscure explanation of the symptom, when it is so evidently a direct result of the catarrhal process. In most cases, probably, it is due to the nasal stenosis, causing habitual mouth breathing with a resultant dryness of the larynx and trachea. In other cases it is due to the catarrhal inflammation which sooner or later involves the whole upper air tract, in the one case giving rise to a dry, hacking, irritating cough, unaccompanied by secretion, while in the other case there is a moist cough with more or less profuse expectoration.

Symptoms referable to the ears I believe to be present in a far larger proportion of cases than is usually recognized by our standard authorities either on throat or on ear diseases. Deafness is perhaps the earliest and most easily recognized symptom with which we meet in this connection, and yet this is a somewhat vague expression. A moderate diminution in the hearing distance as tested by the watch will probably be recognized in a very large proportion of cases of intranasal disease, and yet when this diminution is but moderate it is not always safe to say that it constitutes a morbid condition directly due to the nasal disease, especially when we remember that, while the watch test is perhaps the best we possess for testing the hearing, yet it is an exceedingly unreliable and uncertain one. We should avoid, therefore, attaching too great importance to it.

Disease of the middle ear, as recognized by notable impairment of hearing, retraction, atrophy or calcification of the membrana tympani, together with obstruction of the Eustachian tube as determined by politzeration or the use of the catheter, is by far the most frequent morbid condition of the auditory apparatus met with in connection with intranasal disease. This affection is undoubtedly a direct result of the hypertrophic process in the nasal chambers.

In a certain proportion of cases of hypertrophic rhinitis, tinnitus aurium is met with, usually in connection with middle-ear disease,

though in a smaller number of cases there is apparently no organic lesion. That this distressing symptom may be dependent on the nasal disease is shown by the fact that, in a flattering proportion of cases, it disappears under treatment, and even in those instances in which complete cure is not accomplished marked relief is afforded.

Hypertrophic rhinitis is also a prominent factor in the causation of attacks of hay fever and asthma. This, however, will be discussed in the chapters devoted to those affections.

Headaches, eye troubles of various kinds, together with a large number of nervous diseases, such as chorea, epilepsy, etc., occur also in connection with intranasal disease. The discussion of this relation is more properly relegated to the chapter on nasal reflexes.

FIG. 26.—Hypertrophic Rhinitis. × 500. *a*, Epithelial layer; *b*, limiting structureless membrane; *c*, adenoid layer; *d*, blood-vessels filled with blood; *e*, acinous gland; *f*, venous sinus constituting a part of the so-called erectile tissue.

PATHOLOGY.—The accompanying cut (Fig. 26) represents a section of a mass removed from the posterior portion of the lower turbinated bone. The changes may be described as follows: The whole mucous membrane is markedly thickened and deeply corrugated. The epithelial layer is augmented or increased in width. The outermost layer of epithelium in specimens from the middle turbinated bones exhibits fine ciliæ, while in sections from the lower turbinated bones the ciliæ are occasionally wanting in places. There are deep valleys running downward into the adenoid layer which are filled with stratified epithelia. The latter consist of elongated epithelia, ten to twelve layers in diameter. The layer nearest the adenoid tissue is occupied

by distinctly developed large columnar epithelia, which, especially where they go to fill the valleys, are very large and composed of several strata. The boundary line between the epithelia and the adenoid tissue is everywhere well marked, and in some places there is even present a layer without distinct structure, the so-called structureless membrane.

The characteristic features of hypertrophy of the nasal mucous membrane, then, may be briefly summarized as follows:

First.—Increase of the covering epithelium, without desquamation.

Second.—Increase of the adenoid layer and its capillaries, with stagnation of blood, together with a new formation of fibrous connective tissue replacing the adenoid layer.

Third.—Increase of the racemose glands, both in the adenoid and submucous layer.

Fourth.—Hypertrophy of the connective tissue between the enlarged veins in the submucous layer.

Fifth.—In advanced stages of the hypertrophic process, an absence of lymph corpuscles, they having evidently been transformed into connective tissue.

At the anterior termination of the middle turbinated bone, the hypertrophic process develops in a somewhat different manner, in that, while there is still evidence of inflammatory action, the thickening of the membrane is largely due to a myxomatous transformation, which gives to the tissue a somewhat soft, gelatinous consistency, with a gross appearance closely resembling that of an ordinary nasal polypus.

Diagnosis.—The question has been raised as to what constitutes a diseased condition of the nasal mucous membrane, and whether we can recognize it in its milder forms by sufficiently characteristic appearances. I think not only that we can do this, but that we should do so in all cases, with the same delicacy of appreciation as is used in the recognition of diseased conditions of other organs, and this by ocular inspection; for since the introduction of the use of cocaine we are enabled to bring into view the whole of the nasal cavities, in a manner so thorough that no morbid process existing there should escape notice.

An examination anteriorly will show the mucous membrane swollen and of a bright reddish-gray color, with perhaps a pink tinge. This is not the bright scarlet color of acute inflammation, nor again the purplish hue of purely venous congestion, but something between the two, the swollen condition being, as we know, due entirely to the plethoric state of the venous sinuses, although the super-

ficial color is given by the hyperæmia of the capillaries of the mucosa proper. The surface of the membrane is rounded, somewhat irregular in shape, and coated with a limited amount of grayish semi-transparent mucus. If the swelling is but moderate, we may inspect a considerable portion of the membrane covering the lower and middle turbinated bones.

On the lower turbinated, behind its anterior extremity, we find the surface presenting a slightly rugous appearance, while on the middle turbinated we notice a brighter red color, together with a smooth, shining surface, but slightly coated with mucus, and, according to the extent of the turgescence, approaching more or less closely toward contact with the septum. If there is considerable swelling of the membrane, we find also the lower turbinated bone approximating itself to the septum, thus rendering an inspection of the cavities beyond impossible.

Examination posteriorly simply brings into view the membrane covering the posterior termination of the middle turbinated bone, together with the posterior half or two-thirds of that of the lower turbinated bone. We find here an appearance differing essentially from that seen in front. The membrane here presents a condition which has been called grubworm hypertrophy, from the fact of its striking resemblance to large white grubworms, lying one on either side of the septum. On the lower turbinates will be seen a rounded whitish mass, with a raspberry-like outline of surface, presenting minute furrows and fissures crossing it in irregular lines. This same appearance is seen on the middle turbinated, although the masses are much smaller, and present an elongated spindle-like contour.

The superior turbinated tissues may occasionally be seen by this examination, but are rarely the seat of any morbid process.

A still further development of the hypertrophic process is occasionally recognized by the examination, in which the posterior termination of the lower turbinated bones presents the appearance of large rounded masses with the same rugous surfaces, which more or less completely fill the oval openings of the posterior nares (see Fig. 27)—a condition first described, I believe, by Lefferts and to which the name of posterior hypertrophy has usually been given by writers. Bigelow, in demonstrating the turbinated bodies, called attention to the fact that, if this tissue is artificially distended by a blowpipe, "a pouch-like process projects from the rear of the bone, increasing its length."

Bigelow's observation easily explains why these so-called "posterior hypertrophies" occur.

So far our examination has shown us the existence of hyperæmia

of the membrane, the amount of which has been recognized by the eye. The amount of true hypertrophy which exists in the membrane has not yet been ascertained. There is now to be thrown into the anterior nares a four-per-cent solution of cocaine by means of the spray apparatus, the effect of which will be to thoroughly expel the blood from the membrane. The action of the cocaine should be carefully watched, and the thoroughness of the application and the completeness of its action be awaited. When the membrane has become thoroughly exsanguinated, we shall find the whole of the nasal passages brought completely under observation, unless some condi-

FIG. 27.—Large Masses of Hypertrophied Membrane on the Posterior Termination of the Lower Turbinated Bones, More or Less Completely Filling the Posterior Nares.

tion other than the one under consideration exists to interfere with the inspection. We find now the lower turbinated bone covered with a soft, thick, somewhat velvety membrane, which adheres closely to it, and reveals the bony outline more or less completely, according to the extent of the structural thickness of the membrane. Now, if there were no hypertrophy existing in the mucous membrane, the lower turbinated bone would appear almost like a cord lying against the external wall of the nose, covered by a closely adherent, thin, parchment-like membrane, possessing a thickness not sufficient to mask the general contour of the bony structure beneath. If, however, the membrane is the seat of connective-tissue hypertrophy, this will be recognized by the extent to which it does mask the normal bony contour. In front there will be a soft, rounded, cushion-like knob, as it were, grayish-white in color; it can be moderately indented by the probe, which in all cases should be used freely over its surface, in order to gain accurate knowledge of the extent of the hypertrophic process. Looking along this surface beyond the anterior extremity, we shall find the membrane presenting, as a rule,

less evidence of thickening, both on inspection and to the impact of the probe, but still sufficient to give a rounded outline to the bone beneath.

If now the head is thrown backward and the middle turbinated tissues are brought into view, they will be seen covering the bone somewhat closely, of the same general tint as the membrane below, but as a rule presenting also a thickened mass anteriorly, which here, instead of hypertrophy, assumes more of a polypoid appearance. The hypertrophy is of a somewhat myxomatous character, and hence the swelling is not so markedly reduced by the use of cocaine. The probe should be used here also to determine the character and location of the hypertrophic process.

If now we examine posteriorly, the same appearances will present as were seen before the cocaine was applied, with this change, however, that the swollen masses on the posterior terminations of both middle and lower turbinated bones present less prominently, and are smaller in size. Superficially, however, they show the same grub-worm-like membrane as before described.

Treatment.—The first question which arises in the discussion of the treatment of this affection is as to the value of local applications, such as astringents, alteratives, and stimulants. That these have an effect in temporarily relieving the troublesome symptoms of the disease, I think, no one will question, but when we consider what the morbid lesion is, namely, a deposit of connective tissue in the intervascular tissues, whereby the important functions of the membrane are hampered, I think that all must concede that a simple local application, by means of spray or douche, can have but a very ephemeral effect. Furthermore, their efficiency is quite as great when applied at the hands of the patient himself as when applied in the office of the physician. There are certain remedies, then, whose action we all recognize, and whose aid we seek by directing that the patients shall make use of them in the intervals of their attendance upon office treatment. If there is much nasal stenosis with mucus accumulation in the upper pharynx, a cleansing wash is always grateful to the patient, and he should have it near him for frequent use, simply as a part of his toilet apparatus. With this we may combine both the cleansing properties of the alkalies with one of the simple astringents, such as:

℞ Acidi carbolici, ... gr. iij.
Sodii bicarb., ... gr. xij.
Sodii biboratis, ... gr. xxx.
Glycerini, ... ʒ ss.
Aquæ, ... ad ʒ vi.
M. ft. lotio.

To this may be added a vegetable or mineral astringent, such as:

℞ Acidi tannici,	. . . . .	gr. x.	to the ounce.
Zinci sulphatis,	. . . . .	" ij.	"
Aluminis,	. . . . .	" v.	"
Zinci sulpho-carbolatis,	. . . . .	" iij.	"
Zinci chloridi,	. . . . .	" i.	"

These are best used by the convenient little atomizer shown in Fig. 18, thus avoiding the inconvenience and possible dangers of the Thudicum nasal douche. In the absence of an atomizer, I think the simple device of insufflation of warm salt water from the hand may be safely recommended to the patients, when any comfort results from the cleansing of the passages thereby secured. Snuffs, whether insufflated from the fingers or blown by an insufflating apparatus, possess no advantages over aqueous solutions. They simply call upon the mucous membrane for a sufficient amount of water to dissolve their efficient ingredient before they can exert any influence, unless we except those which are used for stimulating purposes, and here we have a method of local relief for such cases which is oftentimes of undoubted temporary benefit. There are certain remedies which, when applied to the nasal membrane, give rise to pain and irritation, for the time, followed by a more or less profuse watery discharge from the nose. Their first effect is rather distressing, the ultimate effect exceedingly grateful to the patient. The watery discharge which they excite seems, as it were, to unload the plethoric veins by this profuse exosmosis, which in its discharge seems to wash out the glands, and carry away a lot of surface débris, by which the membrane is for a time very markedly relieved, and the discomfort of the patient much alleviated. The ultimate effect, however, is of somewhat questionable advantage. Certain of the largely advertized catarrh snuffs sold in the drug stores act on this principle. The most notable of these remedies are perhaps bicarbonate of sodium, bromide of potassium, sanguinaria, galanga, etc. None of these remedies should be applied undiluted to the nasal mucous membrane in a state of hypertrophy, although all of them possess beneficial qualities in the atrophic form of the disease. The only advantage of powders is that they may be carried in the vest pocket and used at frequent intervals. The principle of their action is the same as that of the lotions above given; hence we may prescribe them of the same proportions, substituting a bland, neutral powder for the water. If the stenosis in these cases is troublesome, I see no objection to placing in the hands of the patient a two-per-cent solution of cocaine, with a small atomizer, by the occasional use of which he may give himself the temporary relief that this drug affords.

All of these remedies, it should be understood, are merely palliative; the permanent cure of these cases depends upon measures which will diminish hyperæmia, remove structural hypertrophy, and restore the normal calibre of the passages. The object of treatment, it must be remembered, is not destruction of tissue, but its restoration to a healthy condition. Extensive sloughing, followed by cicatrization, might result in a condition quite as deleterious, or even more so, than the disease which it was originally designed to remove. The last stage of atrophy is really a stage of cicatrization. If this plan of treatment were carried too far, we might easily produce a condition closely resembling an atrophic rhinitis in its advanced stages. The same objection lies with equal force against the various devices which were greatly in vogue some years since for wrenching away this hypertrophied membrane by means of forceps, or the canula scissors of A. H. Smith as described by Robinson, and Woakes' nasal plough. It should be stated, however, that these devices have deservedly fallen into general disuse. Local astringents having failed to accomplish any notably good results in these cases, these harsh measures, above alluded to, were taken up and advocated for a while with considerable earnestness; but the results of treatment proved disastrous in many cases, and search was made for still other medicaments for controlling the disease. Naturally, the use of caustics was then taken up, and still with the idea, that the destruction of tissue was the end to be accomplished, for we early find recommended the most powerful chemical agents, such as Leyden paste, Vienna paste, and nitric acid, together with the galvanocautery. Some years since, in discussing this question, I entered my protest against these measures, claiming that better results would be secured by milder treatment in cases in which the object was merely to reduce hypertrophic conditions, and then advocated the use of glacial acetic acid. Since that time, I have abandoned the use of this agent for one possessing more valuable properties as a caustic, namely chromic acid, on the ground that these powerful agents were apt to do harm rather than good, on account of the difficulties in limiting their application.

It cannot be too forcibly emphasized, I repeat, that the object of treatment should not be to destroy tissue, but to constrict the blood-vessels, diminish the nutrition, and thus counteract hypertrophy. We know that the deep cavernous layer, by furnishing an increased blood supply, is the primary seat of the trouble. No destructive agent, applied as we are in the habit of using them in treating the nasal mucous membrane, can cause necrosis of more than the superficial epithelium, and possibly, to a very slight degree, of the sub-

mucosa; it does not affect the deep or cavernous layer, which is the one chiefly concerned. To what, then, is the beneficial action of a caustic application due, for it certainly is of great benefit?

Until quite recently caustic applications were effective simply by the contraction of the superficial slough formed. By this contraction the calibre of the venous sinuses was diminished, and the walls of the vessels were enabled to regain their proper tone. Since the discovery of the wonderful power which cocaine has of contracting blood-vessels, caustic applications have been much more efficient. The ordinary procedure is, by an application of cocaine, to deplete the vessels by diminishing their calibre; then by applying caustic to the most prominent points, we pin down this already contracted tissue by the formation of a superficial slough, maintain the vessels in a state of contraction until they can regain their normal tonicity, and thus control nutrition.

What agent shall we use to accomplish this purpose? Shall we resort to the various chemical agents, or to the potential cautery? The effect is the same in either case. For a considerable time I have used chromic acid to the exclusion of all other agents.

Fig. 28.—The Author's Chromic-Acid Applicator.

The extreme nicety with which it can be applied, without cumbersome or expensive apparatus, its efficiency, and the absence of unpleasant effects following its intelligent use, have been sufficient to commend it to me, to the almost total exclusion of other agents. It has been claimed that cicatrices result from its use, but I have never observed them. It seems almost paradoxical to control a morbid process by a destructive agent, but at the present stage of our therapeutic resources we possess no better method.

The special manner in which it should be used is as follows: A small, slender probe, such as is shown in Fig. 28, is first dipped in a little mucilage, and then four or five of the slender acicular crystals of the acid are taken up upon it, and held over a flame until they are fused into a small tear, as it were, on the end of the probe, which on cooling will present a small, solid red bead of amorphous chromic acid, which can be easily manipulated and carried to the part, already anæsthetized and exsanguinated by the application of cocaine, which it is desired to medicate, without danger of injuring healthy tissue.

The galvano-cautery, since its use was first advocated by Middledorpf, has come into very extensive use, and is warmly advocated by Mackenzie, Moldenhauer, Sajous, Lennox Browne, Seiler, Schech, Robinson, Moure, and others. All of these writers give it preference over other methods, and many of them have presented us with ingenious forms of batteries which are claimed to possess certain advantages.

A smaller number of authorities, while recommending it, fail to give it the first place as a caustic agent, such as Woakes, Cohen, Wagner, and others. I think I do not overstate the case when I say that the potential cautery possesses no advantages over the chemical cautery if properly and deftly applied, and with a nice appreciation of what is to be accomplished. The battery is a large, unwieldly, cumbrous apparatus, excedingly liable to get out of order, and a constant source of annoyance by its liability to fail us just when it is most needed, from short circuiting, polarization, or, more likely still, some hidden and undiscoverable fault which hampers its working. In treating hypertrophic rhinitis. this somewhat complicated apparatus is used to develop a certain amount of heat in a small platinum electrode, for the purpose of endowing the electrode with a moderate amount of destructive potency. Now, as we have already shown, the amount of absolute destruction which we wish to accomplish is very limited. It would seem, therefore, that we resort to a somewhat irrational process for accomplishing all this, when a few crystals of chromic acid, fused on the end of a probe, will accomplish the same purpose equally well. In condemning the use of the galvano-cautery methods, I do not attempt to criticise the results thereby obtained. There can be no question as to the success of the so-called galvano-caustic treatment. I merely say that we put ourselves to a vast deal of unnecessary trouble and inconvenience when we use this instrument. I think, however, another point worthy of consideration is that, in introducing the cautery electrode into the nose, and developing in it a high degree of heat, we do incur a certain amount of risk. Most writers recognize this, and make special allusion to the violent reaction that may set in following its use, giving rise to an acute rhinitis, a distressing neuralgia, an acute dermatitis, or even an attack of facial erysipelas, as I have seen in three cases—complications which rarely, if ever, attend the proper manipulation of a chemical agent. Notwithstanding what has been said, the galvano-cautery is an exceedingly attractive method of treating affections of the nasal cavities, and undoubtedly will always remain a popular instrument. I have had personal experience with a number of different forms of cautery batteries, and find it difficult to designate any particular

apparatus as offering special advantages. Of the two forms of galvano-cautery batteries, viz., the chemical and the storage, I think the preference usually will be given to the former, in that the charging of the storage battery requires either a somewhat elaborate apparatus in one's office, or the inconvenience of sending it to the electri-

Fig. 29.—Galvano-Cautery Handle with Flat Electrode for Use upon the Turbinated Tissues.

cian for restorage. Of the dip-plate batteries, perhaps none is better than the inexpensive instrument manufactured by Meyrowitz, for, although somewhat bulky in size, it is simple, and not especially liable to get out of order. The cautery handle should be light and easy of manipulation. In Fig. 29 is shown perhaps as efficient an instrument as any other. It is mounted with a flat electrode, suitable for use upon the turbinated tissues. Other forms of electrodes, designed to fulfil special indications, will be selected according to each operator's preference. Various forms of these are shown in Fig. 30. The electrode should be bent at an angle of forty-five degrees with the handle, thus enabling the operator to follow the platinum tip closely with his eye, in order that the cauterization shall always be accomplished directly at the summit of any projecting mass of hypertrophied tissue. The platinum tip used should, as a rule, be quite small, and in making the application a limited surface only should be burned over at each sitting. Furthermore, it is well to keep up a slight motion, if possible, in the instrument after the current is turned on, which should always be done after it is carried to the desired locality, and shut off before it is withdrawn, in order that the electrode may cool, and thus healthy tissue in other parts of the nostril escape injury by the instrument on its removal. The object of the slight motion recommended is to prevent the electrode from adhering to the burned tissues, for when this occurs its withdrawal is usually attended with a tearing away, by which the blood-vessels are ruptured, and hemorrhage ensues. The degree of heat in the instrument, when feasible, should be regulated. This is not possible, however, in all cases. A red heat is preferable, as there is danger of the extreme white heat burning more extensively than may be

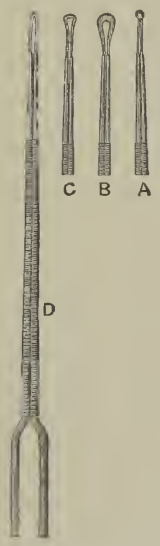

Fig. 30.—Nasal Electrodes. *A*, Bulb-pointed; *B*, knife; *C*, curette; *D*, point.

desired. It is often recommended to use a cautery knife, by which the surface of the membrane may be incised as it were, thus burning a furrow well into the turbinated tissues. I think, however, as a rule, a superficial burning, producing a slough such as has been described in connection with chromic acid, will be all that is sufficient, using for this purpose a small flat electrode. A twenty-per-cent solution of cocaine, of course, should be used in the manner already described in connection with chromic acid. After the burning, the cavity should be repeatedly washed out with a cleansing spray, thus cooling the membrane and allaying such irritation as may be caused by the application.

As a rule, caustic applications are not specially painful, and yet, in many cases, notwithstanding the use of cocaine, a certain amount of pain referable to the burned surface will be produced, while in others severe neuralgia will be caused as the result of the caustic acting on the terminal filaments of the nerves. When this occurs, it is well to allay it immediately, otherwise it may persist many hours. For this purpose nothing is better than the application of dry heat, which is usually accomplished by holding a towel against the hood of the rhinoscope or the chimney of a coal-oil lamp for a few seconds, and applying it to the face, changing the towel frequently. This is simple and perhaps more convenient than the hot-water bag or the Japanese pocket stove, either of which may be used. The caustic applications should be repeated at intervals of a week or ten days.

These measures will be fully equal to the reduction of chronic hyperæmia with hypertrophy of the nasal mucous membrane, where no complications exist. If the cause of hypertrophic rhinitis is a deflected septum, any measure for the reduction of the hypertrophic process will give but temporary relief, while the exciting cause remains.

A condition is not infrequently found in these cases which has already been alluded to, and which consists of an hypertrophy of the posterior extremity of the lower turbinated bone. Cauterization does not reduce these masses, and surgical interference is always necessary.

For the removal of this redundant tissue we possess no device which is so efficient as the cold wire-snare écraseur, which has come so largely into use of late for the removal of growths, hypertrophic masses, etc., in the nasal passages. To the late Dr. Jarvis is undoubtedly due the credit of having introduced the principle of écrasement, as applied to nasal growths, or certainly to have demonstrated its great value, when he devised the very ingenious and yet simple

instrument which is known as Jarvis' snare (shown in Fig. 31). The wire to be used in this instrument is the highly tempered steel piano wire, the No. 5 being perhaps best adapted for all purposes. The working of the instrument is obvious. The two ends of the wire are passed up through the inner tube, and firmly fastened to the projecting pins on the outer tube, leaving a loop projecting from the distal extremity, which is drawn within the canula by turning the nut, and thus carrying the outer tube before it.

FIG. 31.—Jarvis' Wire - Snare Écraseur.

One great advantage of this instrument consists in the substitution of the principle of écrasement for that of snaring, whereby the growth is separated without injuring healthy tissues, and at the same time the danger of hemorrhage notably diminished. Another, and very important feature of it, consists in the use of the steel piano wire, which furnishes a loop of such strength and resistance, that it can be readily carried into the nasal cavity and fitted about a growth without yielding or bending, thus affording a facility in manipulation, which is in no manner equalled by the soft annealed wire loop.

In dealing with the above condition of posterior hypertrophy the Jarvis instrument is to be preferred. This is mounted with a loop, which an examination of the mass has shown to be sufficiently large to embrace it, and is then introduced through the nares until the end of the loop passes the end of the turbinated bone and is free in the upper pharynx. The loop, having been bent slightly to one side before entering the nares, will, by its own elasticity, slip over the mass, when it can easily be drawn into place and the tumefaction cut through. Of course, there is liable to be a considerable hemorrhage as the result of this procedure, but if the operation be done slowly, a half hour or even an hour being consumed, it may often be done without loss of blood. If, however, hemorrhage does occur, a plug of absorbent cotton can easily be passed back and wedged between the cut surface and the septum, and allowed to remain until the following day, if necessary. The relief attending this operation is immediate and striking. The accompanying illustration, Fig. 32, gives a side view of this posterior hypertrophy. It is a drawing by Dr. Jarvis of a morbid specimen in his possession. There is also shown in the plate the snare in position for severing the mass.

A condition not unlike this at the posterior termination of the

lower turbinated bone is frequently met with, though in a far less degree, at the anterior termination of the same body. This consists of a rounded, puffy-looking mass, which encroaches on the lumen of the anterior nares, more or less completely filling it, and serving to obstruct materially the entrance of air.

Hypertrophy of the membrane of the middle turbinated bone occurs in a large majority of cases anteriorly. It is of a loose structure, and assumes a myxomatous character presenting to the eye a bluish-gray appearance, between the nasal mucous membrane and a nasal polyp. This may develop on an otherwise healthy turbinated bone, or the

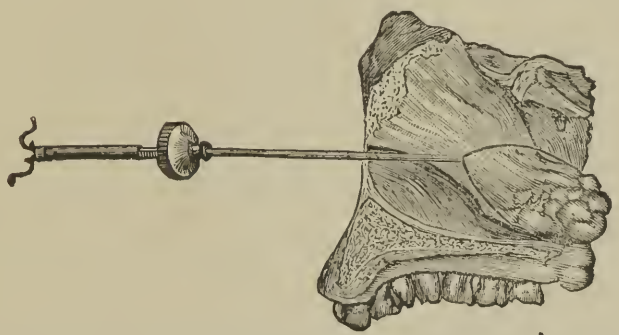

FIG. 32.—Lateral View of Posterior Hypertrophy of the Mucous Membrane of the Lower Turbinated Bone, with Jarvis' Snare in Position for Section.

bone itself may become enlarged and unrolled, as it were, on itself, in such a way as to present a large shuttle-like prominence, projecting downward and inward, thus encroaching upon the normal lumen of the cavity. No hesitation should be felt in removing this mass, and we possess no method better than the use of the steel wire snare. The steel wire loop possesses sufficient firmness to enable the manipulator to carry it well over the mass, which can be then easily severed. In many cases a portion of the bone is removed with the thickened membrane, which I think is always permissible, as probably the deformity of the bone has much to do with the development of the hypertrophy. The snare, I think, should always be used in these cases, as caustics are inadequate to their destruction. The galvanocautery loop may be used, but the cold wire is more easily manipulated and the operation is completed more rapidly.

Hemorrhage as the result of operations on the middle turbinated bone is comparatively rare, although three cases of operation in this region at my hands have been followed by this accident; the hemorrhage being exceedingly intractable, plugs not only being

rendered necessary, but their removal not being feasible until the third day.

In the treatment of all cases of catarrhal disease, special stress should be laid on the enforcement of those general hygienic measures which have already been fully discussed in the chapter on taking cold. A catarrhal process is kept up oftentimes and aggravated by the same conditions which give rise to the phenomenon of taking cold. The same general hygienic laws which we have already discussed under the heading of prevention of cold should be specially enforced.

CHAPTER X.

PURULENT RHINITIS OF CHILDREN.

This expression is used to describe an affection which is met with exclusively in children, and which is attended with a purulent discharge from the nasal mucous membrane.

While recognizing the existence of the acute purulent rhinitis in new-born children, as dependent, probably, on infection from the vaginal passages of the mother, we meet with a large number of cases which commence in the earlier years of childhood, in which the disease pursues an essentially chronic course and in which a purulent discharge is the prominent feature. It is purely local in character, dependent on no constitutional dyscrasia, and consists essentially in an increased secretion of mucus in the earlier stages, together with a rapid desquamation of epithelial cells, and in from five to ten years develops finally into what is known as atrophic rhinitis. The disease, in fact, is the first stage of so-called dry catarrh or ozæna. From a clinical point of view, it is a very noticeable fact, in pathological processes involving mucous membranes certainly, and probably all tissues of the body, that in youth the epithelial structures are especially liable to become the seat of diseased action, whereas in adult life this tendency seems to disappear, and in place of it there obtains a tendency to the involvement of the connective-tissue structures.

Now, this peculiar tendency in childhood shows itself in a notable activity in the development of the epithelial cells, under the stimulation of any of those causes whose agency we recognize in the production of inflammatory processes. Furthermore, this activity in epithelial development may result in two distinct processes. In the one, we find the new epithelial cells building themselves upon the parent structures and remaining a permanent element in the tissue. In other words, a true epithelial hypertrophy takes place and results, in the case of the tonsillar gland for instance, in an hypertrophied tonsil. In another case, a rapid process of desquamation sets in. Now, as to why these new cells in the one case build themselves upon

the membrane, and in the other case are thrown off, I do not suggest a reason. Certainly it is not dependent on any constitutional dyscrasia which destroys the power of the individual cell to maintain its identity as an integral part of the membrane, for, if there is any notable dyscrasia in these cases, it would seem to be more marked in those instances in which hypertrophy takes place, rather than the desquamative process. An ordinary acute inflammation of the mucous membrane of the nasal passages in a child does not result in congestion of the mucous membrane involving the turbinated tissues. If a child has an attack of what is called cold in the head, in a majority of instances it is an acute inflammation, with swelling of the glands of the vault of the pharynx, producing more or less complete nasal stenosis, from occlusion of the posterior nares. In the less frequent cases, it is the mucous membrane lining the nasal chambers. When this occurs, we notice this susceptibility already spoken of immediately showing itself, and the superficial layer of the mucous membrane, the epithelial layer, becomes the seat of marked morbid activity, differing essentially from the process which occurs in adult life. Now, with the first attack of a cold, the symptoms may not differ in a very marked manner from a cold in adult life, but as these attacks recur there sets in a notable tendency to a rapid proliferation of epithelial cells, which, being thrown off in connection with an excessive mucous discharge, give rise to a muco-purulent secretion. These repeated attacks of the acute disease finally develop into a chronic rhinitis, characterized by no very noticeable nasal stenosis, but by a more or less profuse purulent discharge, and the disease which is the subject of this chapter is established. Commencing, as a rule, at from three to five years of age, it runs a somewhat slow course of from ten to twelve years, when it develops into an atrophic rhinitis.

The morbid process, from the beginning to the end of the disease, is identical in all its features, except as to the degree of activity. It is a catarrhal process in the first year, and it is a catarrhal process always. The deeper tissue structures are but slightly involved, and the surface layer becomes the site of but one form of diseased activity, and that consists of an epithelial desquamation together with muco-purulent discharge. Ulceration of the soft parts, or necrosis of the bone beneath, are never, under any circumstances, a part of the progress of the disease.

In some cases, the disease commences in the first year of life, although in these cases there is no tendency to a more rapid development of the later symptoms. As a rule, the purulent character of the discharge is maintained until about the fourteenth or fifteenth

year, although, in one case which has come under my observation, the atrophic stage with crust formation developed as early as the eighth year of age.

Etiology.—It is a very common assertion that atrophic rhinitis and ozæna are dependent on the scrofulous diathesis. Of course, this assertion would necessarily include this dyscrasia as the cause of the disease in question. In my own experience, children affected with this affection present a picture of rugged health which would scarcely warrant the suspicion of any constitutional dyscrasia, nor can syphilis be said to have any influence, either in producing or in indirectly causing the disease. The clinical history of syphilis presents a series of symptoms of a totally different character. Many forms of catarrhal disease in children have their origin in an attack of scarlet fever, measles, or some other of the exanthemata. My experience is that a purulent rhinitis rarely commences in this way. On the contrary, the catarrhal affections which have their origin in a febrile attack are characterized by hypertrophic changes. I know of no assignable cause for the disease, other than taking cold, and this we explain by the neglect of the ordinary hygienic rules of proper living, as already discussed in a previous chapter.

Symptoms.—The prominent symptom of the disease is a mucopurulent secretion usually of a bright yellow color, and having its source from both nostrils. This is expelled in considerable quantities into the handkerchief, and also makes its appearance about the nostrils, constituting what is often called a "dirty-nosed" child. There is no especial obstruction to the nasal passages, except as the result of the accumulation and drying of the secretion about the anterior nares. The discharge is generally through the nostrils, although more or less of it is drawn down or makes its way into the fauces. During sleep the secretions are apt to accumulate to such an extent as to cause mouth breathing. The child, of course, is liable to take cold, during which there are exacerbations, and the attack is attended with a more profuse discharge containing a large amount of serum. During the exacerbation sneezing is a rather prominent symptom, though at other times it is not present, the sensibility of the nose being diminished rather than increased. Fetor, so prominent a symptom in the atrophic stage of the disease, is never present while the discharge remains fluid and moist.

Diagnosis.—A rhinoscopic examination anteriorly reveals the mucous membrane covering the turbinated bones somewhat swollen, and of a reddish tint, with perhaps the appearance of a mild subacute inflammation, but rarely presenting the active turgescence and bright red appearance of an acute inflammatory process. Coating the faces

of both the lower and middle turbinated bodies will be seen flakes and strings and even large masses of bright greenish-yellow muco-pus, in a semi-fluid state. An examination of the fauces will show muco-pus coating the posterior wall of the pharynx and trailing down its wall in stringy masses. This condition, however, it should be remembered, is also seen in connection with disease of the adenoid glands of the vault of the pharynx. An examination of the vault of the pharynx, however, will usually reveal whether any morbid condition exists there to account for this post-nasal discharge.

The diagnosis, however, is not based on the rhinoscopic examination alone, but can easily be made both from the objective symptoms and by elimination. A purulent discharge is met with in children as the result of strumous ulceration and necrosis, the presence of foreign bodies, blennorrhœa, diphtheria, and the late stages of acute rhinitis met with in connection with the exanthemata. If there are any other causes, they are of exceeding rare occurrence. Syphilitic or scrofulous disease gives rise to an exceedingly offensive discharge of pus, mingled with blood, from one or both nostrils, but it is accompanied by so many marked symptoms of blood poisoning that a mistake in diagnosis need not be made. A foreign body in the nose gives rise to a purulent discharge, as a rule, from but one nostril. A purulent rhinitis invariably involves both sides. Furthermore, inspection and examination with a probe should always eliminate this source of error. Blennorrhœa occurs as a rule in the new-born child, and is characterized by such activity of the morbid process, both as regards the amount of discharge and the swollen condition of the membrane, as to render its recognition comparatively simple. Furthermore, the conjunctival membrane rarely escapes the blennorrhœal poison. Purulent discharge from the nose in connection with diphtheria and the exanthemata need not, of course, be confounded with the disease under consideration.

Prognosis.—These cases, as before stated, run a course of from eight to ten years' duration, the symptoms developing slowly and the discharge increasing in amount, showing a tendency to accumulate in the passages and becoming thicker and more inspissated in character as the years go on. During this time the mucosa proper becomes the seat of no marked changes other than a moderate congestion of its blood-vessels. The epithelial layer, on the contrary, is slowly but surely wasted, from the loss of its superficial layers, and becomes abnormally thin, while at the same time the mucous glands and follicles become, to an extent, involved, so that they, also becoming subjected to the desquamative process, lose a certain amount of their lining epithelium. Hence, it will be easily understood how in

the later years of the disease the prognosis becomes somewhat unfavorable as regards an ultimate cure. In earlier years, however, I believe if proper treatment is administered, and carried out with sufficient persistence and attention to detail, that we may hope not only to arrest its further progress, but ultimately entirely to cure the affection.

Treatment.—The first step in treatment will consist in the use of some simple lotion, by which the pus discharge may be thoroughly removed from the cavity and the surface of the membrane thoroughly cleansed. For this purpose any simple alkaline wash will be found efficient, to which may be added a small amount of carbolic acid or listerin.

Dobell's solution answers an excellent purpose, or perhaps better still we may use one of the following formulæ:

℞ Listerin, ... ℥ ss.
Sodii biboratis, ... ʒ ss.
Glycerini, ... ʒ vi.
Aquæ, ... ad ℥ vi.

Or,

℞ Thymol, ... gr. x.
Sodii chloridi, ... ʒ ss.
Sodii benzoatis, ... gr. xx.
Aquæ, ... ad ℥ vi.

These cleansing lotions are best used by means of a small single-bulb atomizer, such as is sold in the drug stores, the best of which perhaps is that shown in Fig. 18. This should be used at the commencement of treatment at least three or four times daily, the wash being thrown into both nostrils and the child being taught to cleanse the passages as thoroughly as possible by blowing the nose immediately after. In lieu of the atomizer an ordinary ear syringe may be used, but as a rule I think the atomizer preferable.

After the membrane is thoroughly cleansed, an astringent should be used in the same manner, by means of the syringe or atomizer, preference being giving to those agents which possess the property of controlling cell proliferation.

For this purpose we may use one of the following:

℞ Zinci sulpho-carbolat., ... gr. xx.
Hydrarg. chloridi corros., ... gr. ½
Aquæ, ... ad ℥ iv.
M.

Or,

℞ Acidi borici, ... ʒ ij.
Aquæ, ... ad ℥ iv.

To any of the above there may be added, with benefit, one of the simple astringents, or they may be used alone.

The effect of these agents should be noted, and a change in the special drug employed occasionally made, as it would seem that even the best of local remedies lose to a certain extent their effect from long usage. Occasionally good results will be obtained by the use of ordinary skimmed milk, or, even better still, buttermilk. These may be used pure or in combination. To equal parts of lime water and buttermilk may be addded sulpho-carbolate of zinc of a strength of two grains to the ounce. Permanganate of potash is a remedy of a certain amount of value in controlling cell proliferation, and may be often used with benefit, in the strength of three to five grains to the ounce.

Watery solutions are to be preferred, in the treatment of these cases, to other forms of medication. Inhalations and vapors are probably without effect. Powders, however, because of their convenience may be used with benefit, the patient being directed to carry a box in his pocket for frequent application.

In addition to local treatment, general hygienic measures are especially indicated in these cases, not perhaps from any features belonging to the disease itself, but rather on account of the tender age of the patients with whom we have to deal and their peculiar vulnerability to changes of temperature. These measures are embraced briefly under the injunction that a daily cold sponge bath to the waist should be used and absolutely pure all-wool flannels worn next to the skin in summer and winter; together with the other general directions as to sleeping apartments, clothing, exercise, etc., which have been given in the chapter on taking cold.

Internal medication is not indicated, and yet it has been my habit for some years past, perhaps as a matter of routine, to administer cod-liver oil, which seems to exercise a certain amount of controlling influence on the disease.

CHAPTER XI.

ATROPHIC RHINITIS.

It will be noticed that we embrace all forms of catarrhal inflammation of the nasal mucous membrane practically under the two heads, atrophic and hypertrophic. The distinctive character of atrophic rhinitis was first pointed out by myself in a paper read before the Seventh Session of the International Congress of London in 1881. The view there laid down I still regard as the true explanation of the development of the disease. Commencing in a desquamative inflammation, a purulent rhinitis is set up, which constitutes the early stage of the disease under consideration.

The progress of the disease as a purulent rhinitis has already been fully described. In that chapter it was stated that the predominating morbid condition consisted in the desquamation of epithelium from the surface of the mucous membrane. Now, so long as this desquamation is confined to the superficial epithelial cells, we can easily understand that the disease is attended with a thin and fluid muco-purulent discharge. Naturally, however, the morbid process will not confine itself to the superficial layer of the membrane, and the glands are rapidly involved; the muco-purulent discharge assumes a more inspissated character, and clings to the turbinated bodies. As the disease progresses, the turbinated bones themselves become atrophied. As the result of impeded circulation, due to the adhering crusts already described, the circulation of the blood in the deep layer of the membrane is so far arrested as to rob the bone itself of its normal nutrient blood supply, thus causing an atrophy, by which eventually the bones disappear more or less completely from the nasal cavity, leaving only small and scarcely recognizable ridges on the outer wall. We have here, I think, a rational theory of the development of purulent rhinitis, and ultimately of atrophic rhinitis, which harmonizes fully with the clinical history of the disease.

We have thus established, under the name of atrophic rhinitis, a disease which probably comprises a large number of the cases which have heretofore been embraced under the general term of ozæna. It

may be repeated, in this connection, that this term is one used to describe a symptom, and not a disease, and by earlier writers has been used to describe all diseases of the nasal cavity characterized by an offensive discharge and a fetid odor. With our increased knowledge of intranasal disease and the advancement in our methods of diagnosis, the term ozæna, as describing any definite form of nasal disorder, of course, disappears from our literature.

In brief, the changes consist in an atrophy of the mucous membrane, in which the morbid process is not due to a connective-tissue hypertrophy encroaching on the glandular structures of the membrane, but rather to the transformation of epithelial structures into inflammatory corpuscles, together with an active epithelial desquamation from the surface of the membrane and from the lining of the acini.

The follicles are surrounded by heaps of lymph corpuscles, but there is no evidence of transformation of these corpuscles into connective tissue, showing us that the inflammatory process is most marked in the neighborhood of the acini, but that it does not develop into a hyperplastic process. The morbid changes are, therefore, atrophic from their outset, and bear no relation whatever to the hypertrophic form of the disease.

I am cognizant of no other investigations of like character, made on the living subject, although Fränkel, Gottstein, Krause, Hartmann, and Habermann have all made microscopical study of the pituitary membrane in this disease, from the dead subject. The results of their investigations do not differ materially from my own.

Fränkel finds the lesion to consist essentially in the disappearance of Bowman's glands, the mucous glands of the lower turbinated bone remaining unchanged. Gottstein finds thickening of the connective tissue about the glands, with cloudiness of the epithelial lining. Krause finds a fatty degeneration, both of the mucous membrane and of the gland epithelium. Habermann believes the lesion to consist of a fatty degeneration of the gland epithelium, not alone of Bowman's glands, but of the acinous glands, thus partially coinciding with Krause.

These views, it seems to me, are important, as affording us a probable explanation of the epithelial desquamation which characterizes the earlier stage of atrophic rhinitis, for, although my own studies fail to reveal evidences of this fatty degeneration, some explanation was needed to account for the desquamative process. If this fatty degeneration is found in a large number of cases, we need seek no further for a cause for the desquamation.

Etiology.—We have already discussed the question of causation of purulent rhinitis, and this disease I believe to be, in every case, a

cause of or the primary stage of the atrophic form. Allusion has already been made to the statement that atrophic rhinitis develops as a later stage of the hypertrophic form. Fränkel, as before stated, was the originator of this idea, which has been followed very generally by subsequent writers, who all, however, content themselves with accepting Fränkel's original view, without stopping to question seriously the grounds on which it was based. Furthermore, an examination of their writings shows a striking absence of careful clinical observation to establish the teaching. The only clinical support that I have been able to discover, is the observations of Wagner and Schäffer, the one having discovered this change to have taken place in a child of fourteen at the expiration of about six months, while the latter asserts that it takes place only after the expiration of ten years or more.

I have studied my own cases very critically, and I find it a universal, general rule, that purulent rhinitis is a disease of childhood, and atrophic rhinitis of adult life; that purulent rhinitis develops into atrophic rhinitis very rarely later than the twentieth year, and in the majority of cases earlier than the sixteenth; and, furthermore I have failed to discover any evidence that the hypertrophic form of the disease had ever existed before the patient came under my care. Now, there can be no question but that a large number of our cases of hypertrophic rhinitis come under treatment between the ages of twenty-five and thirty-five. If it is possible that this disease can result in the atrophic form in six months according to Wagner, or in ten years according to Schäffer, our clinical records certainly would show some evidence of it. I have never seen a case of atrophic rhinitis which developed its atrophic symptoms later than the twenty-fifth year.

Zaufal is alone in the view that atrophic rhinitis or ozæna is due to congenital deficiency in the turbinated bones. This theory is based on careless observation, for the atrophy of the turbinated bones occurs only in the late stages of the disease, and is rarely met with before puberty. Zuckerkandl finds in an examination of two hundred and fifty-two skulls of children no single case of congenital atrophy. Chatellier believes the atrophy of the turbinated bones to be due to a rarefying osteitis. Gellé, on the other hand, does not believe there is an osteitis, but refers the atrophy to interference with nutrition.

Chatellier's idea naturally suggests a general dyscrasia, whereas, as already stated, I think these cases are rarely, if ever, attended by any evidence of impaired general nutrition. Gellé, however, would seem to have arrived at somewhat the same conclusion as I have.

What has been said as to the causation of purulent rhinitis, applies of course to the atrophic form of the disease. In the chapter on the former, the statement was made with marked emphasis that atrophic rhinitis bore no possible relation to syphilis in any of its stages or manifestations. The same broad statement may be made in regard to tuberculosis and scrofula, and yet we find Schäffer making the statement that in one hundred and nineteen cases he found ninety-nine of strumous and twenty of syphilitic origin. In two cases the complaint was distinctly due to hereditary syphilis; while Wyss makes the statement that more than half of his cases of ozæna had a tuberculous history, but he found very few cases complicating phthisis. By the term ozæna he excludes all cases of syphilitic or carious disease of the nose.

Symptomatology.—The symptoms which characterize the disease are the direct result of the apparent increase of secretion, and of the impairment of function of the mucous membrane. On account of the limited amount of serous exosmosis, the discharge becomes so thickened that it lodges within the cavity, and crust-formation becomes the prominent symptom of the disease. The presence of these crusts in the nasal cavity gives rise to more or less irritation, and occlusion of the nares results.

The development of fetor soon follows and always constitutes the most prominent and distressing feature of the disease. Fournier believes the odor is due to a specific secretion of the glands of the pituitary membrane, likening the fetid odor of ozæna to that which is occasionally observed in connection with the feet. This is ingenious, but I believe it is a universal rule that a fetid secretion does not occur in nature. An excretion may be fetid, but never a secretion.

Epistaxis occasionally occurs as the result of the erosions produced by dry incrustations, especially on the septum. These erosions, it should be stated, are of a trivial character and never, under any circumstances, develop into anything resembling an ulcerative process, although they may occasionally develop into small perforations of the cartilaginous septum, leaving permanent communication between the two sides. Mackenzie explains these perforations by the habit of picking the nose, which patients resort to in order to remove the accumulated crusts.

Dryness of the pharynx becomes a prominent symptom of the disease very early in its history, and the lower pharynx also presents a dry, glazed appearance, and swallowing becomes somewhat difficult. There is more or less irritation of the larynx and bronchial tubes. Hoarseness is often present, and impaired vocal function always.

A form of laryngitis has been described by writers, notably Lennox Browne, characterized by the formation of dry crusts in the larynx and trachea. The implication seems to be that a diseased condition really exists in these parts, but it is difficult to determine any notable morbid lesion here, and I should rather lean to the view that it is purely a symptomatic affection. Spasm of the glottis, of a very distressing character, I have met with in connection with atrophic rhinitis, in young women of highly nervous organization, and in men in vigorous health, with no suspicion of neurotic tendencies. In these cases it has disappeared upon directing vigorous measures to the nose. Its occurrence can be explained only by the presence of inspissated mucus or pus in the larynx acting as a foreign body.

Moderate impairment of hearing occurs in the later stages of this disease in probably a large proportion of cases, while a graver form of deafness is not an infrequent complication. Wyss, of Geneva, in an examination of sixty cases of the disease, found ear trouble in forty-seven, including, probably, all cases of moderate diminution of hearing distance. Burnett, of Philadelphia, found an atrophic condition of the nasal mucous membrane in fourteen and one-half per cent of cases of chronic catarrhal otitis media. Beverley Robinson, without giving definite statistics, makes the statement that aural complications are met with in atrophic rhinitis far more frequently than in hypertrophic. Buck, Roosa, and Mittendorf apparently make no distinction between the two forms of rhinitis, as causing ear complications.

I have always regarded hypertrophic rhinitis as a very active cause of middle-ear troubles, in the manner already described in the chapter on that disease. Certainly in a given number of cases of grave impairment of hearing, the number due to the hypertrophic disease outnumbers those due to the atrophic disease in far greater proportion than the comparative frequency of the two affections. Furthermore, when we consider the success of our treatment of hypertrophic rhinitis, and our failure to do more than relieve the atrophic form, it would seem that my own observation as regards the relative frequency of these causes of ear disease is the correct one. The manner in which hypertrophic rhinitis acts to produce middle-ear disease, has already been described, and would seem clear and direct. On the other hand, the action of the atrophic form of the disease in producing ear complications does not seem so clear. I am disposed to think that the ear is quite as dependent upon healthy nasal passages as the bronchial tubes. In other words, the air which reaches the orifice of the Eustachian tubes should reach that region through the nose, and be at normal atmospheric pressure, of the tem-

perature of the body, and in a state of saturation. Any departure from these conditions involves danger both to the ear and to the bronchial tubes.

Diagnosis.—An examination anteriorly will reveal on first inspection each cavity more or less filled with greenish-yellow crusts, lying upon the faces of the lower and middle turbinated bones, and bridging across the intervening space to the septum. These crusts present an appearance which is absolutely characteristic of atrophic rhinitis, in their peculiar greenish-gray tint, thus differing essentially from the crusts found in ulceration and necrosis, which are mingled with blood, unhealthy pus, and necrotic tissue. They are usually found in the front portion of the nasal cavity, while an examination by posterior rhinoscopy will show the turbinated bones comparatively clean. If now the crusts be removed by the forceps or probe from the surfaces of the turbinated bones, there will be found underlying them, and apparently oozing from the fissure between the lower and middle turbinated bones, and also from beneath the upper, healthy-looking whitish-yellow muco-pus. After thoroughly cleansing the cavity by means of the syringe or coarse spray, if the disease is in its earlier stages, we find the mucous membrane over the lower and middle turbinated bones presenting a fairly healthy aspect, normal in color and contour. Thus far, the only evidence of the disease which we have met with, is in the characteristic crusts. In the later stages of the disease, however, we find on thoroughly cleansing the cavity, the membrane covering the lower and middle turbinated bones presenting a somewhat bloodless appearance, and adhering closely to the turbinated bones beneath, and having the appearance of a thin and somewhat attenuated membrane, while the bones themselves, according to the stage of the disease, present a shrunken and atrophied appearance, leaving a noticeably large roomy cavity, through which the wall of the pharynx may easily be recognized. In advanced cases the turbinated bones may even be difficult to find, presenting simply small, cord-like protuberances along the outer wall of the cavity.

An inspection of the pharynx, both in the early and late stages of the disease, will show a dry, glazed, parchment-like condition in its lower portion, while in the vault will be noticed a plug of thick mucus, adherent to the pharyngeal roof and more or less discolored by the dust of the inspired air which has not been arrested in its passage through the nose. The larynx and trachea present a fairly normal appearance, unless there are visible flakes of inspissated mucus, or in rarer cases dry incrustations. The membrane lining these cavities may be somewhat congested, presenting evidences of a condition of chronic hyperæmia, but rarely of a catarrhal inflammation.

Prognosis.—When we consider the essential character of the disease, we can easily appreciate that we have to deal with an exceedingly obstinate affection and one which in most cases will resist all treatment. The question presents, Can we cure it? Fränkel, of Berlin, very frankly says: "A cured ozæna is unknown to me," referring to atrophic catarrh. In the early stage of the disease, before the fetid symptoms have set in, I have seen cases recover. In the advanced stages characterized by fetor, and in which the turbinated bones have almost entirely disappeared, I have not seen a case cured, if, by a cure, is meant a condition secured in which there remains no necessity for any measure of local treatment. All cases can, I believe, by thorough and painstaking treatment, be brought to that point when, by the use of very simple means, the ground that has been gained can be secured, and the patient be kept entirely free from any annoying symptoms, so long as he continues to make use of some simple cleansing lotion applied three or four times daily, but we are never justified in holding out to our patient any hope of a genuinely radical cure.

Treatment.—The first indication in the treatment of the disease is, of course, the thorough cleansing of the cavities, by the removal of all the incrustations. In the accomplishment of this end, there is no special virtue in any remedy, or local agent. The literature of the subject embraces a formidable array of drugs, among which are prominent carbolic acid, salicylic acid, boric acid, permanganate of potassium, phosphate of sodium, bicarbonate of sodium, thymol, borax, etc. The essential requisites of a good cleansing lotion are secured by the use of any solution which is alkaline and is disinfectant. The fluid should be alkaline for its solvent action upon mucus. It should be disinfectant, in order to neutralize the results of the process of decomposition which is going on in the retained secretions. Any fluid, then, possessing these qualities, is an efficient cleansing solution. The formula I generally prefer is the Dobell's solution, as follows:

℞ Acidi carbolici., ... gr. xij.
Sodii bicarb., ... ʒ ss.
Glycerini, ... ℥ ij.
Sodii biborat., ... ʒ i.
Aquæ, ... ad Oi.
M.

Of quite as much importance is the method by which the cleansing is accomplished. The most efficient douche we possess is the ordinary post-nasal syringe. By means of this instrument a stream can be driven with great force through the cavities. In ordinary

cases, this is sufficient to thoroughly detach all the crusts, and cleanse the parts. In advanced cases, however, it will be necessary to use a probe wrapped with a pledget of cotton. This can be passed through the nostril and along the turbinated bones, thereby separating the crusts, after which they can be easily washed out with the syringe. Occasionally it will be necessary to throw a stream through the nostril by means of an ordinary ear-syringe. The essential point is to remove all secretions from the nose, and the success of the manipulation can be determined only by repeated inspections by means of a good illumination, and with the anterior nasal speculum in place. After the parts are thoroughly cleansed, the next step consists in the application of a stimulant agent. If the disease is essentially an atrophic process, and the fetor is due to a process entirely outside of the membrane, then the rational treatment, and the one directly curative of the disease in the membrane proper, is to stimulate the parts to a better performance of their normal function, viz., the secretion of mucus.

Gottstein advocates the use of the cotton tampon for the promotion of secretion and the correction of fetor, in atrophic rhinitis. Beverley Robinson indorses their utility, while Woakes makes use only of Gottstein's tampons for the purpose of applying powders to the diseased membrane, thus securing the local action of his medicament together with such benefit as may result from the plugging process. Both Sajous and Mackenzie advise the use of the galvano-cautery at white heat, as first recommended by Fränkel. Lennox Browne considers this decidedly the best treatment, and follows the application of the cautery with insufflations of iodoform or iodol, claiming to relieve thereby both the ozæna and the aural symptoms. Woakes recommends the application of iodoform in ether, in the form of spray. Cohen recommends the vapor of ammonium chloride, administered by means of Lewin's apparatus.

As regards the use of the galvano-cautery, it seems to me this measure should be resorted to with the greatest caution, as it is an agent capable of doing much mischief. The essential feature of the disease is loss of tissue, a condition which might be enhanced by so powerful a destructive agent. As a stimulating measure, however, I can see how, with care, it might be attended with good results, especially in the earlier stage of the disease. Iodol and iodoform I have never regarded as agents of much power, other than as disinfectants, although Seifert recommends the insufflation of iodol, after the cavity has been tamponed for one or two hours according to Gottstein's method.

Following a previous suggestion of Shurley, as to the treatment

of pharyngitis sicca by means of the galvanic current, Bryson Delavan, of New York, recommends this treatment for a similar nasal condition. His method is as follows: The positive electrode is to be placed on the nape of the neck, while the negative is wrapped in absorbent cotton and applied directly to the nasal mucous membrane. The strength of the current is from four to seven milliampères, the duration of the application being from seven to fifteen minutes, or until a moderate watery secretion is induced. Delavan secures excellent results from this plan of treatment, which seems exceedingly rational and well worth a trial.

The primary cleansing of the parts must be done at first by the physician, in the manner already suggested. At the commencement of treatment it will be necessary to see the patient daily, or perhaps three times each week. After the disease has been brought somewhat under control, the intervals of attendance at the office may be lengthened as may seem best. At the same time the patient should be directed to provide himself with an atomizer, preferably the Burgess, in which there may be used any simple alkaline or disinfectant lotion, such as the Dobell's solution already given. This is to be thoroughly applied to each passage five or six times daily if necessary. The patient, being instructed as to the character of his disease and the indications for treatment, will easily appreciate the object of the spray, viz., to prevent crust formation, and will make the applications as they may be needed.

An exceedingly convenient cleansing lotion, and one which I frequently use, has been suggested by Seiler, composed of several of the salts of sodium in combination with thymol, eucalyptol, menthol, etc. It is made into the form of a tablet, and sold in the drug stores as Seiler's Antiseptic Tablets. One tablet dissolved in two ounces of water forms a solution of the proper strength.

In addition to the frequent use of the spray, the patient should be directed to use once each day, by means of the nasal douche, from one to two quarts of hot water, in each quart of which a tablespoonful of salt has been dissolved. This should be used as hot as can be tolerated. The beneficial effect of this is especially noticeable at the commencement of the treatment, in altering the character of the discharge, rendering it less purulent, and thus controlling crust formation. It acts probably both in controlling cell proliferation and in giving tone to the walls of the venous sinuses, as well as a cleansing wash.

In addition to the above I have occasionally found some benefit from the use of local applications, in the form of snuff, of certain drugs whose action is to stimulate the membrane to a freer secretion.

As before stated, the general health of patients suffering from atrophic rhinitis is not usually affected, and hence there are no indications for internal medication. These patients, however, as well as all who suffer from catarrhal disorders, are peculiarly susceptible to changes in the weather, etc., and hence their habits of life, general hygienic surroundings, clothing, bathing, etc., should receive full attention at the hands of the physician.

CHAPTER XII.

CROUPOUS OR FIBRINOUS RHINITIS.

Croupous rhinitis is an acute inflammation of the mucous membrane lining the nasal passages. It occurs in both children and adults. although in children it is more protracted and its symptoms more aggravated. It is characterized by a deposit of fibrinous exudation, which presents the anatomical features of a croupous membrane, viz., one which is superimposed upon the epithelial layer and does not involve the deeper tissues. It has already been stated, in the chapter on mucous membranes, that a fibrinous exudation is mainly to be regarded as a local manifestation of a general blood condition, a local exudation involving no serious danger to life, except when it involves the larynx.

This disease is of frequent occurrence, and yet is mentioned but rarely in current literature. Fränkel refers somewhat casually to it, as a complication of diphtheritic disease of the nose, while Schuller gives a somewhat more accurate description of it, but still appends the name diphtheritic. Cohen refers to a fibrinous exudation as a somewhat rare occurrence in acute coryza. He undoubtedly recognized the disease as distinct from diphtheria, but, with this exception, we find that most writers entertain exceedingly vague ideas as to the distinctive character of the two affections.

Etiology.—Strazza, in a report of two cases, says he discovered the Klebs-Loeffler bacillus in the membrane of one; in the other he found a streptococcus which resembled neither the bacillus of erysipelas nor the pyogenes. Concetti reports five cases of pseudomembranous rhinitis; from two were obtained the Klebs-Loeffler bacillus; in two others there was a history of direct infection from one to the other, with paralysis in one of them; in the fifth there was a secondary appearance in the larynx. Baginsky, Park, Abel, and Birkett report cases in which they found the true diphtheritic bacillus.

The disease undoubtedly is frequently caused by or follows operations in the nose, not only after the galvano-cautery, but also any operation which involves a section of the membrane. A croupous

membrane forms on the cut surface without manifesting any tendency to extend, and while the local symptoms are not so marked, the febrile symptoms are often quite as acute as those in an idiopathic case of the disease.

Pathology.—The essential pathological lesions observed in the mucous membrane proper, are those of an ordinary acute rhinitis. On the surface of the membrane, and somewhat closely adherent to it, is a false membrane, which presents under the microscope the ordinary appearances of a croupous membrane. Exudation occurs on the faces of the lower and middle turbinated bones, and, in aggravated cases, on the septum in the anterior portion of the nares. I have never noticed any tendency to extension to the accessory sinuses, although their orifices are closed by the swollen nasal membrane and distressing symptoms referable to those cavities may occur thereby.

Symptomatology.—The disease is generally ushered in by chilly sensations, and more rarely by a well-marked chill. This is followed by general febrile condition, by headache, pains in the bones, and loss of appetite. Coincident with these, symptoms of acute rhinitis set in, characterized by swelling of the nasal membrane, stenosis, watery discharge, and sneezing. The dry stage is omitted, and there immediately sets in a sero-mucous discharge from the nose, which soon becomes somewhat purulent in character. The amount of the discharge is rather excessive throughout the whole course of the disease, but never assumes a fetid character or gives rise to any offensive odor.

At the onset of the disease, the thermometer will often show a temperature of 101° to 103° F., which, lasting one or two days, subsides somewhat, and the further progress of the attack is accompanied by a temperature of 100° to 101° F.; although in adults the temperature may become normal after the second or third day. The local symptoms referable to the nose are oftentimes of a very distressing character. There is usually complete stenosis, with loss of the sense of smell, together with frontal headache, and oftentimes severe neuralgic pain along the course of the nasal nerve. The disease usually extends to the glands in the vault of the pharynx, and occasionally to the faucial tonsil. In these regions, however, we usually find a simple follicular tonsillitis, the croupous exudation confining itself to the crypts of the follicles, although Moldenhauer has seen a true fibrinous membrane on the faucial tonsil.

Diagnosis.—If care be exercised in the examination and the secretions removed from the passages, the characteristic pearly white membrane will be seen covering the nasal lining and extending down very closely to the muco-cutaneous junction. In some cases, the

membrane does not extend near to the margin of the nostril, and the nasal cavity is obscured by the swelling of the turbinated tissues, and the excessive amount of secretion; and, furthermore, cocaine is of little avail in shrinking up the membrane and opening the cavity to inspection. In such cases, the diagnosis will be aided by gently wiping out the cavity with a pledget of cotton on the probe, and endeavoring to detach a portion of the false membrane, whose presence should be suspected in every case of apparent acute rhinitis in which the constitutional symptoms seem excessive and the local symptoms of so aggravated a character.

In adults, the false membrane is small, thin, and easily recognized as a croupous exudation, and furthermore is not attended with excessive muco-purulent secretion. In children, however, the exudate often forms a soft, thick, almost granular mass, very friable, which in some cases can almost be wiped from the mucous membrane in small fragments. A bacteriological examination of the membrane is always imperative.

Prognosis.—The prognosis is favorable. The disease runs its course in adults in from eight to fourteen days, while in children it usually lasts from three to five weeks.

General Treatment.—Abbot has shown that the treatment appropriate to diphtheritic cases is most often used with benefit in these cases. The patient should be isolated at once. Tincture of iron should be administered in full doses, as soon as the disease is recognized.

Some preparation of quinine or cinchona should be given with iron, for its general tonic effect. In young children, in whom the pseudo-membranous formation assumes a rapid and efflorescent type, I believe the efficacy of mercurial treatment should be thoroughly tested in the early stage of the attack. Preference should be given to the use of the mild chloride, which may be administered in full doses, frequently repeated.

If, at the end of the second day, decided amelioration of the local symptoms is not noticed, the iron treatment had best be substituted. If fever is present it should be managed on the same general principles which govern our administration of remedies in other febrile conditions in childhood. The same, of course, may be said in regard to the necessity of laxatives, etc.

Local Treatment.—Our first effort should be directed toward the removal of the membrane, care being taken not to injure the soft parts beneath, or better still, if free access can be obtained to the pseudo-membrane, it should be destroyed in situ, its capacity for mischief being ablated and the inert film left in place, to prevent a new

growth. This, I think, can best be done by one of the iron preparations. The use of cleansing washes by means of an atomizer is grateful to the patient, if feasible, but in young children the stenosis is so complete as to render their availability somewhat limited.

Moldenhauer recommends the use of warm inhalations, while Hartmann and Bresgen both recomend the use of iodoform after the removal of the membrane, either as an insufflation or in suspension in glycerin. Cocaine, as before stated, has but a limited action in controlling the stenosis. If the part can be sufficiently cleansed, however, to admit of the application of cocaine, a four-per-cent solution should always be resorted to, and frequently repeated, both as controlling the blood supply and relieving nasal stenosis.

CHAPTER XIII.

NASAL REFLEXES.

The subject of nasal reflexes is one which possesses great interest, not only because of its curious symptoms, but also from the broad field it now embraces, the result of increased knowledge of intranasal disease. To Marshall Hall the credit is due of first making clear the phenomena of reflex actions, though it seems that Johann Mueller was pursuing a similar line of investigation, the results of which were published the same year. Many of the earlier physiologists however, had already recorded these phenomena, notably Whytt, Procheska, and Cullen, who recognized the reflex character of sneezing, coughing, vomiting, etc.

This reflex tendency is very active in the respiratory apparatus, especially in the nose. Thus Brown-Séquard (cited by Ruault) observed that by plunging the nose into cold water respiration and cardiac action would be stopped, while Kratschemer and François-Franck, as cited by the same author, showed that thermic, mechanical, or chemical irritation of the nasal fossæ can reflexly produce a drawing up of the nares, arrest of respiration in expiration, momentary arrest of the heart, and slackening of the pulse. The first writer to call attention to the nasal reflex was Voltolini, who reported a case of spasmodic asthma, dependent on the existence of nasal polypi, which was cured by the removal of the growths. This observation has been verified by so large a number of writers that it seems to me the connection between the two diseases cannot well be questioned, though Lennox Browne and Boecker state that, in many instances, the asthmatic symptom persists, even after the removal of the polypi. This question, however, is more fully discussed in the chapter on asthma.

The possibility of other reflexes due to intranasal disease was not recognized until Seiler published two cases of reflex cough, due to a hypertrophic rhinitis; followed by Hack, who observed a case of spasmodic cough due to a fibrous polypus. A similar observation was made by John Mackenzie.

Some years previously, however, Richet had reported a case of convulsive tic douloureux, which was cured by the removal of an enchondroma of the nasal septum.

Interest in nasal reflexes was first excited when Hack reported a large number of nasal reflexes; gastralgia and dyspepsias; cardiac palpitation; tumefaction and redness, either temporary or permanent, of the skin of the nose; transitory and circumscribed œdemas; salivation; neuralgia of the first two branches of the trigeminus; cephalalgia; migraine; scotoma; ciliary neuralgia; photophobia; vertigo; agoraphobia; and exophthalmic goitre.

These affections Hack found were due to various forms of intranasal diseases, although the large majority was dependent upon hypertrophy or chronic hyperæmia of the nasal membrane. Hack thinks that simple hyperæmia without hypertrophy is more frequently a source of nasal reflex than a true hypertrophy with tissue change, and that sneezing, watery discharge with stenosis alternating from one side to the other constitute conditions which indicate, almost pathognomonically, that the turbinated bodies are the source of reflex phenomena. This is undoubtedly true, for these symptoms indicate not an ordinary catarrhal inflammation, but a vasomotor paresis of the blood-vessels of the nasal mucous membrane, the essential condition which exists in hay fever. This disease is not met with in highly neurotic individuals, and the neurotic habit, I take it, is the most active predisposing cause of a nasal reflex.

An interesting symptom has been observed by Max Schäffer, of Bremen, who reports a case of complete loss of voice, with no observable lesion of the larynx, in a case of hypertrophic rhinitis. Local faradization proving useless, the cure was effected by treatment directed to the nasal hypertrophy. Elsberg reports a case of chorea, occurring as a reflex due to hypertrophic rhinitis. Similar observations have been made by J. L. Sallinger and the author. Cases of epilepsy, due to intranasal disease, have been reported by Sallinger, Fincke, and myself, while a case of psychical epilepsy has been reported by T. A. McBride. Ziem reports, among the reflex symptoms, a case of nocturnal enuresis. Dr. North, in adding neurasthenia to the list of nasal reflexes, goes so far as to state that he has yet to see a case of neurasthenia in which there is not some catarrhal trouble.

Salivation would seem a rather curious reflex disturbance, as a result of intranasal disease, and yet two such cases have come under my own observation, in elderly people. In both these cases the result of treatment was quite successful. A similar case has been reported by E. Fränkel, as cited by Ruault.

The question of ocular disturbances dependent on intranasal disease seems to have excited the attention of American observers more notably than of foreign, although Hack mentions weak, watery eyes in his list of affections. In an able paper by Dr. Gruening, a number of cases of photophobia with mild conjunctivitis were reported as cured by treatment for intranasal disease. Similar observations have been made by Beverley Robinson. Cheatham, also, holds that many cases of asthenopia are due to intranasal disease. B. Bettman, of Chicago, reports six cases of epiphora, conjunctivitis, photophobia, and pain above the eyes, due to nasal disease, which were cured by galvano-caustic applications to the inferior turbinated bones. Lennox Browne reports a case of glaucoma not benefited by iridectomy but cured by the eradication of a nasal polyp.

If we attempt to explain these various reflexes we find ourselves compelled to adopt rather vague and indefinite theories, which are quite as obscure as the reflexes themselves. Mackenzie claims to have discovered certain sensitive areas in the nose, which are peculiarly connected with the evolution of the reflex act. These areas embrace simply that portion of the nasal mucous membrane wherein we have the turbinated bodies, which, owing to their intense and constant activity as an important part of the respiratory apparatus, must necessarily be exquisitely sensitive, far more so than other portions of the nasal chambers.

That the condition in the nose which more frequently causes reflex action is hyperæmia rather than hypertrophy, as stated by Hack, I think is fully borne out by clinical observation. Moreover, this is easily explained by the fact that hyperæmia generally occurs in patients of a decidedly neurotic temperament. That the neurotic temperament is a prominent predisposing cause of a nasal reflex, I think none will question. John Mackenzie, also, recognized that "where complete atrophy of the turbinated structures existed, as for example in ozæna, reflex action was not present, nor could it be induced by artificial stimulation." That reflexes, however, never occur in connection with atrophic rhinitis, cannot be asserted when we consider that such careful observers as B. Fränkel and Schmaltz have reported cases of facial neuralgia and vertigo occurring as nasal reflexes in atrophic rhinitis. Finne also cites a case of neuralgia of the fifth nerve of three months' duration, in an anæmic woman of fifty, which was dependent on atrophic rhinitis. The reflex in these cases is most probably due to impaired general nutrition. Furthermore, the cause of these neuralgias is the same as of the frontal headache which occurs in acute coryza arising either from occlusion of the orifice or from congestion of the lining membrane of some of the accessory

sinuses, producing nerve pressure. If we glance now at the various diseases which occur, we find that they divide themselves into neuralgias, spasmodic or paralytic nervous affections, and ocular symptoms; the neuralgias, embracing migraine and cephalalgia, occur only in patients suffering from impaired general nutrition. Any patient, I take it, suffering from an obstructive lesion in the upper air passages feels, to a certain extent, the systemic effect of the resultant impairment of the process of oxidization.

In the large majority of cases, spasm of the glottis is a direct symptom. Where it occurs as a reflex, the method of development probably is much the same as in an asthmatic attack. Owing to the intimate connection between the two regions, as parts of the respiratory apparatus, any vasomotor disturbance in the nasal mucous membrane is liable to give rise to disturbances in other portions of the passages. In the same manner we may explain the occurrence of spasmodic contraction of the faucial or palatal muscles which has been recorded by Seifert, who reports a case of chronic contraction of the muscles of the face, soft palate, and Eustachian tube, with objective and subjective gurgling sounds in the ear, due to a chronic rhinitis, although local treatment failed to afford any relief; while Michel has observed "chronic spasm of the Eustachian tube, with objective and subjective gurgling sounds in the ear," in a lady of forty years of age, relieved by removal of polypi with the cold snare.

Functional aphonia is always, I think, a pseudo-paresis of the adductor muscles of the larynx, and occurs, as a rule, in hysterical females. I have seen cases such as Schäffer reports, in which the loss of voice was apparently a nasal reflex, and, furthermore, in which apparently the success of nasal treatment justified this view, and yet the aphonia sooner or later recurred, as is the usual rule in hysterical affections of the larynx.

Chorea is one of the diseases which, when dependent upon intranasal disease, gives most satisfactory results from treatment. I have seen a number of such cases in which the choreic movements disappeared completely and permanently with the cure of the nasal disorder. Dr. Jacobi has also found chorea associated with chronic rhinitis, enlarged tonsils, and other obstructive lesions of the air passages.

Sallinger and Fincke both report cases of epilepsy cured by treating concurrent intranasal disease, while B. W. Richardson reports a case of a lady thirty-four years old, cured of epilepsy by the removal of a post-nasal fibroma. My experience has been less fortunate, for, although in three cases which have been under my treatment great improvement, and in one case an apparent cure, followed the removal of obstructive nasal lesions, in all cases the disease re-

turned. In these cases the epileptic habit probably had become so far fixed that the seizures were not controlled by removing the contributing cause. In the same category, probably, might be included vertigo, which is rather a frequent reflex nasal symptom.

Ocular reflexes present many points of clinical interest, and yet when we attempt to state the direct connection that exists we find ourselves again treading on purely theoretical grounds. Gruening was probably the first to call prominent attention to these reflexes, all of which were relieved by treating a pathological condition of the nasal membrane.

Regarding the success of treatment in these cases, it is safe to say that in none of the reflexes are the results more thoroughly satisfactory than in morbid lesions of the eye dependent upon a diseased nasal mucous membrane.

While there are no diagnostic signs which enable us to recognize reflex disturbances as due to intranasal disease, it should be borne in mind that those cases in which such phenomena occur, as a rule, show evidence of a decided neurotic temperament. If on examination of the nasal cavity we find the mucous membrane swollen and at the same time presenting the watery appearance, while it is not itself notably reddened, it should immediately suggest to us a paretic condition of the vasomotor control. If, now, a four-per-cent solution of cocaine be applied by means of an atomizer, and the membrane, after contraction, is seen to cling closely to the turbinated bones beneath, showing no evidence of true hypertrophy, we have further indication of a neurotic condition.

Hack has made much of his cocaine test for the existence of a reflex, making use of it to produce anæsthesia, which, he says, when thoroughly established oftentimes will abolish the reflex phenomena demonstrated by the probe before the membrane was anæsthetized. This would apply to reflex cough, laryngeal or faucial spasm, and possibly certain cases of neuralgia. Headache, if it is dependent upon nasal reflex, readily yields to the local application of cocaine in a very few minutes, and then, of course, the diagnosis is immediately established. This, however, I think applies only to the congestive headaches, the result being due to the contractile properties of cocaine rather than to the anæsthesia. In ocular and other obscure reflexes we have no method of making a diagnosis other than by observing the success of local treatment.

Nasal polypi and deformities of the nasal septum are not infrequent conditions which give rise to reflex phenomena. I do not think, however, in either of these cases that it is the original lesion which causes the reflex, but rather a paretic condition of the mem-

brane to which it gives rise. In nasal polypus it is generally stated that a watery secretion from the nose is due to the hygroscopic character of the growth, by which it absorbs and discharges moisture according to the state of the weather. Personally, I am disposed to think that the source of the serous exudation is in the venous sinuses. In other words, we have a vasomotor paresis of the mucous membrane, a condition most frequently associated with the reflex phenomena due to the presence of the growths. The frequency with which polypus is attended with reflex neuroses, I think, is due to the fact that in the majority of cases it impinges upon and irritates the mucous membrane covering the middle turbinated bone, and this region is probably more frequently the source of reflex disturbances than the lower passage, on account of its more delicate sensibility.

When, therefore, we find a nasal polypus giving rise to asthma, this is not due directly to the presence of the polypus, but to the morbid condition in the mucous membrane caused by the presence of the polypus. On the other hand, when a supra-orbital neuralgia or a simple headache occurs as a reflex symptom, I think we give a more rational explanation of the symptom in saying that it is due to pressure exercised on the peripheral nerves. When an examination fails to reveal any evidence of vasomotor disturbance in the nasal mucous membrane, we must attribute reflex disturbances to a simple hypertrophic rhinitis. In rare cases adenoid growths in the vault of the pharynx become a source of reflex symptoms.

In the local treatment of these conditions, I am convinced that successful results are due primarily to the removal of the local intranasal disease.

The neurotic habit is a prominent factor in the production of these disturbances in many cases, and always requires attention. In these cases no measure is of greater importance than the use of cold water. If well tolerated, a cold sponge down the spine once daily, or better still a shower or douche, will aid us very materially. In addition to this there are two drugs which I regard as of special value, viz., zinc and belladonna. These may be given either singly, or, as I prefer it, in the following pill:

℞ Ext. belladonnæ, ... grs. v.
Zinci oxidi, ... grs. x.

M. ft. mass. in pil. numero xx. div. S. One pill to be taken three times daily before eating.

Arsenic is a remedy which possesses a certain efficacy. Iron, strychnine, and general tonics, which we are so often led to prescribe, I think possess but limited value in controlling the neurotic habit, and hence should not be administered unless specially indicated by other general conditions.

CHAPTER XIV.

HAY FEVER, OR VASOMOTOR RHINITIS.

John Bostock first attracted prominent attention to this affection, although Beschorner has shown that it was recognized by writers in the sixteenth century. Since then various authorities have conducted experiments with a view to discovering the nature of the disease. In 1882 Daly suggested a diseased condition of the nasal cavities as being an important factor in all cases of hay fever. When this disease was first recognized, it was thought to be due to the emanations of dry hay, and hence the term hay fever as applying to the form of the disease usually met with in the later months of the summer. Subsequent investigation revealed that a form of the disease occurred in the early summer months, to which the name rose cold was given. Still later we find appearing in the literature of the subject such names as summer catarrh, pruritic catarrh, pollen catarrh, peach cold, etc. The disease is essentially the same, in whatever season it may appear, and hence we use the term hay fever as a generic expression and as embracing all forms of the affection.

Definition.—We may define hay fever, then, as a disease characterized by the annual recurrence, at a certain season of the year, usually the same period in each individual case, of an attack of a more or less aggravated form of influenza, the prominent symptom of which is an intensely swollen condition of the mucous membrane lining the nasal cavities, attended with sneezing and profuse watery discharge, these symptoms being due to the direct impact upon the mucous membrane of the nasal passages of the pollen of certain flowering plants, present in the atmosphere.

History.—In 1886 the author published a paper in which it was argued that the prominent predisposing cause of all cases of hay fever was an obstructive lesion in the nose, giving rise to a vascular dilatation, caused by the rarefaction of air in the nasal chambers behind the point of obstruction, and further that three conditions were essential for the production of the disease: (1) an obstructive lesion in the nose, (2) a neurotic habit, and (3) the impact of pollen upon the

nasal mucous membrane. At the same time it was argued that hay fever and asthma were identical, in that one disease was a vasomotor rhinitis while the other was a vasomotor bronchitis. In 1887 Sir Andrew Clark, in a paper on the subject, assigned three causes for the disease, viz.: a neurotic habit, an intranasal pathological condition, and an external exciting cause. The later literature indorses these views, and we find few writers who do not accept what I think is to be regarded as the most important of these conclusions, viz., that which regards a morbid lesion of the nasal membrane as a prominent factor in causing the attacks.

Etiology.—At the time of the publication of Bostock's second paper, the idea seems to have been prevalent that the emanations of dry hay had much to do in causing the attack, although Bostock himself regarded this as less active than heat and physical exertion. Phoebus thought that sunlight played an important part in the production of the disease, although he conceded a certain amount of activity to the emanations from flowers and grasses. I think a great mistake was made by the earlier investigators, in that, while searching successfully for the cause of an exacerbation of hay fever, they seemed to regard the pollen as a cause of the disease itself. Beard's brochure was a notable departure from the line of investigation hitherto pursued, in that the analysis of the large number of cases which he collated proved beyond question that the neurotic habit was present in all individuals subject to hay fever, and, still later, Daly's original suggestion of a local morbid condition of the nasal mucous membrane added a third factor to the causation of the disease. We thus find that there are three essential conditions necessary for the production of an exacerbation:

1. The presence of pollen in the atmosphere;
2. A neurotic habit; and
3. A local morbid condition of the nasal mucous membrane.

1. *The Presence of Pollen in the Atmosphere.*—The pollen theory of hay fever has probably received larger discussion than any other. That the presence of pollen in the atmosphere and its impact upon the mucous membrane of the upper air passages are the immediate cause of the exacerbation, I think cannot be questioned, in view of the exhaustive experiments of Blackley.

The question arises, How does pollen act on the mucous membrane? This we cannot answer, other than to state that it produces vascular dilatation when present in the atmosphere in certain quantities. Thus, Blackley has shown that the condition of the atmosphere which will deposit twenty-seven grains of pollen on a disc one centimetre in diameter, in twenty-four hours, is unirritating,

but increase the strength of the atmospheric suspension of pollen until it will deposit two hundred and eighty grains, and we find it producing marked symptoms of irritation. In the same way, a solution of cocaine, one grain to the ounce of water, will have little or no effect locally applied to the mucous membrane; increase the strength of the solution to twenty grains to the ounce of water, and apply it to the mucous membrane, and the result is marked contraction of the blood-vessels. In other words, pollen in the air produces vascular dilatation in certain individuals in exactly the same manner as a solution of cocaine produces vascular contraction. The most active pollens in the production of hay fever are those of the flowering grasses, such as the different varieties of meadow grass, sweet-scented vernal grass, meadow fox-tail, golden-rod, etc.

2. *The Neurotic Habit.*—The neurotic habit, as demonstrated by Beard, is an essential element of causation in hay fever, and serves to explain why certain individuals are sensitive to the action of a pollen-laden atmosphere, while others are exempt. What the essential pathological lesion is, in what we call the neurotic element in hay fever, it is not easy to explain. We know, however, that clinical investigation shows in a sufficiently large proportion of cases of hay fever the existence of a family history showing evidence of neurotic tendencies, such as fully to justify the conclusion that behind all cases of hay fever lies a neurotic habit as a powerful predisposing cause of the disease.

3. *A Local Morbid Condition of the Nasal Mucous Membrane.*—A local morbid condition of the nasal mucous membrane, as a predisposing cause, is present in probably all cases of true hay fever. This lesion must necessarily be one of an obstructive character, and one attended with vascular dilatation. The primary lesion, probably in most cases, is the obstruction, as shown by Harrison Allen.

In addition to the three elements of causation already described, I think we must recognize a psychical influence in many of these cases, as acting to produce the attacks, a peculiar mental anticipation, as it were, which only can explain the fact of the annual recurrence of the disease at fixed dates, some patients going so far as to notice that their disease recurs even at a certain hour of the day each year. We can explain the recurrence of attacks in certain cases on fixed dates each year only by the fact that the individual's mind is so far concentrated on the anticipation of his attack that when the day comes the hay fever symptoms set in. This psychical influence is well illustrated by the case of John Mackenzie in which an attack of rose cold was precipitated by means of an artificial rose. Mackenzie also reports a case in which an attack of hay fever was brought on by

a patient's gazing upon a picture of a field of hay. The explanation of these cases, I take it, is much the same as that of those cases of intermittent fever in which the paroxysm is postponed by changing the position of the hands of the clock.

The minute organisms which Helmholtz discovered in the mucous discharge from the nose have never been verified by other observers. It is altogether probable that what Helmholtz really saw were fragments of mycelium-like threads thrown out by the pollen cells under the influence of heat and moisture, and containing the minute fovillæ of the pollen cell. The relief which Helmholtz obtained by the injection of his quinine solution, therefore, must be attributed largely to psychical influence; for, while immediately following the publication of Helmholtz' experience, the use of quinine solutions became exceedingly popular, it has fallen into complete disuse at the present day.

Age seems to exert a certain predisposing influence in the causation of the disease, in that the larger number of cases develop early in life. Thus, in a series of eighty cases observed by the writer, there occurred:

Between the ages of 1 and 10,	9 cases.
" " " " 10 " 20,	27 "
" " " " 20 " 30,	16 "
" " " " 30 " 40,	21 "
" " " " 40 " 50,	3 "
Over 50,	4 "
Total,	80 cases.

We thus find the large proportion of cases occurring between the ages of ten and twenty, while the predisposition seems to disappear very largely at the age of forty, although, rather curiously, among my own cases, I have had under treatment a patient in whom the disease developed at the age of seventy-three.

All writers coincide in the statement that the disease belongs essentially to the better-educated classes, and that it occurs very rarely among the laboring people. This we can easily understand, when we consider that the disease is essentially a neurosis, and that its development is favored by the surroundings and habits of life of the upper classes, while the contrary is true among the laboring people.

That the large preponderance of cases occurs among males is also a fact noted by all observers. In the five hundred and six cases reported by Wyman, Beard, Phoebus, and myself, three hundred and forty-two were males and one hundred and sixty-four females. This observation would seem rather to conflict with the idea that hay-fever is essentially a neurosis, in that we ordinarily associate the delicate

female physique with a neurotic temperament. The true explanation of the preponderance of male cases of hay fever is in the fact that males are much more exposed to those conditions which favor the development of catarrhal disease. This fact, then, would seem to lend weight to the view already indorsed, that a catarrhal affection of the upper air passages is a powerful predisposing cause to the development of hay fever.

The powerful influence of heredity is well illustrated by Wyman's statistics, who found that in one-fifth of all his cases more than one member of the same family was affected. The same is true of eighteen of my own eighty cases, while in thirty-nine cases there was either hay fever or asthma in the family.

The impairment of the general health observed after a protracted convalescence from a continued fever would occasionally seem to act as a predisposing cause of hay fever. Thus, Sajous has observed cases coming on after an attack of typhoid fever, whooping cough, malaria, or chicken pox, an observation which fully coincides with my own clinical experience.

Pathology.—The essential pathological changes which take place in the nasal mucous membrane, are not those which characterize an inflammatory process, and yet from the various names which have been proposed for the disease, such as Rhinitis vasomotoria (Hertzog), Coryza vasomotoria periodica (John Mackenzie), Rhinitis sympathetica, etc., the inference would naturally be drawn that the exacerbation is regarded as an inflammatory process. The appearances, however, of the membrane in the nose, as will be shown later, do not present the characteristic features of an inflammatory action. The pollen of flowering plants, as has already been noted, possesses the peculiar property of producing more or less complete paralysis of the nerves which control the exosmotic function; in other words, the impact of pollen upon this membrane produces a complete relaxation of the large veins which compose the turbinated bodies, under which they become dilated and their walls admit of free transudation of serum, the veins remaining in this state of dilatation so long as the pollen is present upon the surface of the membrane in sufficient amount, regaining, however, their normal calibre immediately upon the removal of the exciting cause. The capillary blood-vessels of the mucous membrane proper, as a rule, are not involved in the morbid changes which take place in the deep tissues. The pollen, moreover, acts only to dilate those blood-vessels which are involved in its respiratory process, namely the venous sinuses of the turbinated bodies, for we find that the blood-vessels of the mucous membrane proper are unaffected by its action ,retaining their normal calibre. We thus find that the

exacerbation is due entirely to peripheral causes. It might be charged that this view militates against the neurotic theory. The part which the general predisposing neurosis plays in the production of the disease is that it gives rise to a weakness of the vasomotor control, which the sympathetic and trigeminus nerves exercise over the calibre of the venous sinuses, whereby they are rendered susceptible to the action of pollen. The question arises now, whether this vasomotor susceptibility can be accounted for in any other way than by conceding some pathological change in the ganglionic centres. This is a question which cannot easily be decided, and any discussion of it can be carried on only upon theoretical grounds. I see no reason, however, why the condition may not exist without necessarily involving the nerve centres in pathological changes, although the theory of a central lesion is ably advocated by John Mackenzie, who designates it as a "disordered functional activity of the nerve centres," while Kinnear is more definite in his conclusions, finding two forms of the disease, which are due in one case to a hyperæmia, and in the other to a condition of anæmia of the sympathetic ganglia. Hack, on the other hand, believes that the morbid lesion consists essentially in a hyperæsthetic condition of the olfactory and the fifth pair of nerves. The same view is also entertained by Robinson.

Symptomatology.—The onset of the attack is marked by a sense of irritation referable to the upper regions of the nasal chambers, with a sense of fulness or tightness across the bridge of the nose, accompanied with sneezing of more or less violent character. At the same time patients complain of a curious burning or itching sensation about the roof of the mouth, apparently referable to the upper surface of the soft palate. As the attack develops, the nasal membrane becomes swollen, and the passages thereby more or less completely occluded. At the same time the serous exudation sets in, pouring out on the surface of the membrane and escaping from the nostrils in, oftentimes, large quantities. So profuse is this discharge that patients oftentimes feel apparently the passage of the serum in its escape from the blood-vessels, in a sense of intense irritation or formication about the root of the nose. The escape of serum seems to increase the intense irritation in the passages, as shown by the increased violence of the sneezing, which often occurs in paroxysms of considerable duration. With the occurrence of the nasal symptoms, in many cases there is felt at the same time irritation of the mucous membrane of the eyes, and in rarer cases even of the mouth and ears. These symptoms are undoubtedly due to the pollen acting on these membranes in exactly the same manner that it acts upon the nasal passages, as was shown by Blackley.

The blood in the membrane shows a certain hydrostatic characteristic, in that it tends to collect in the most dependent portion. Thus, if the sufferer lies on the back, the fluids collect in the posterior extremities of the turbinated bodies in such a way as to completely occlude the nares, while lying on the side will often have the effect of securing patency of the uppermost nasal passage, while the fluid collects in the lower. These symptoms show a tendency to abatement during the night, which is probably due to the fact that the air of the sleeping-apartment is less laden with pollen than the atmosphere breathed during the day. The waking hours, however, constitute a period of almost unbroken discomfort and suffering. The onset of the attack in most cases is sudden and without warning, although occasionally it is preceded by a feeling of general malaise, with loss of appetite and mental depression, these premonitory symptoms persisting during the course of the exacerbation to a more or less well-marked degree. Aside from these symptoms, evidences of the effect of the disease on the general system are not present.

After the disease has persisted for a varying period of time, usually about two to three weeks, in a certain number of cases an attack of asthma sets in. These asthmatic attacks rarely occur with the first attack of hay fever, but the repeated annual visitation seems to develop a tendency which results eventually in the development of the bronchial disorder.

The question arises, whether the asthma is due to the hay fever, or whether they both may not be due to the same cause. I have discussed elsewhere the connection between hay fever and asthma, taking the ground that they are essentially one and the same disease, regarding hay fever as a vasomotor paresis of the walls of the blood-vessels lining the nasal cavity, while asthma is a vasomotor paresis of the blood-vessels of the mucous membrane lining the bronchial tubes.

There is an intensely active and quick sympathy between the nasal mucous membrane and the bronchial mucous membrane, under which a diseased condition in the nasal cavity tends to develop a similar morbid condition in the bronchial mucous membrane. It is probable also that the pollen acts with a certain amount of potency on the bronchial membrane, in much the same manner as upon the nasal membrane. The reason why it does not act to produce an attack of asthma with the first onset of the hay fever probably lies in the fact that this susceptibility in the bronchial tubes occurs only after they have been subjected to the weakening influence of the nasal disorder for a certain period of time. As the patient goes through his attack year after year, it is noticeable that the asthma occurs in

many cases earlier each year, until finally the asthma sets in immediately on the advent of the hay-fever season. Still another curious fact noticed in these cases is that not infrequently the bronchial asthma seems to take the place of the hay fever. A still further change I have seen in these cases, by which the disorder becomes a perennial asthma, or in other words asthmatic attacks occur at all seasons of the year without reference to pollen in the atmosphere.

Why the hay fever should disappear and the asthma take its place it is not easy to explain, unless that the peripheral irritation has resulted in an intensely irritable condition of the ganglionic centres. The essentially neurotic character of the disease is still further shown by the fact that in a certain number of cases the attack is preceded by a cutaneous eruption, usually of a lymphatic character, although Laflaive has met with cases of urticaria and even eczema.

Course and Duration.—In a very large majority of cases of hay fever, the annual attack commences in the latter part of August and lasts until frost sets in. The usual date assigned is the 29th of August. Many patients assert that their attack recurs each year on exactly the same date, and even at the same time of day, although in most cases the date varies, it may be, several days. As before stated, I believe that in those cases in which the date and hour of the attack are absolutely unvarying, it is due to a peculiar state of mental anticipation which precipitates the attack. I know of no reason why so large a proportion of individuals are attacked in August. These cases are usually designated as autumnal catarrh. The next in frequency to this variety is that which occurs in June, and which is commonly spoken of as rose cold, from the fact that these patients are susceptible to the action of the pollen of the different varieties of roses which flourish at this season of the year. Most writers have regarded all cases as being of these two varieties. Beard lays special emphasis on the fact that he had demonstrated a third variety as occurring in September. As before stated, however, this classification I think only serves to add confusion to the subject, as the disease is essentially the same at whatever season it occurs, and, moreover, in not a few instances we find that patients subject to the so-called rose cold are subsequently attacked in August with what is called autumnal catarrh. Still further, an analysis of cases will show that the attack may come on at any time from the first of May to the last of September. This Beard found in his one hundred and ninety-eight cases, the greatest number occurring between the 10th and 20th of August.

These figures apply only to the onset of the attack, its duration

not being given. An analysis of the duration of the disease in my own eighty cases is as follows:

From May	1st to frost,	.	.	.	.	.	.	.	.	.	1
"	"	15th–25th to July 1st,	.	.	.	.	.	.	.	.	3
"	"	10th to August 1st,	.	.	.	.	.	.	.	.	1
"	June	1st " July 1st,	.	.	.	.	.	.	.	.	2
"	"	1st " " 14th,	.	.	.	.	.	.	.	.	1
"	"	1st " frost,	.	.	.	.	.	.	.	.	5
"	"	10th " July 4th,	.	.	.	.	.	.	.	.	4
"	"	10th " " 26th,	.	.	.	.	.	.	.	.	5
"	July	1st " Sept. 1st,	.	.	.	.	.	.	.	.	1
"	"	10th " Aug. 1st,	.	.	.	.	.	.	.	.	1
"	"	10th " Sept. 1st,	.	.	.	.	.	.	.	.	1
"	"	25th " frost,	.	.	.	.	.	.	.	.	4
"	August	10th–27th to frost,			.	.	.	.	.	.	51
Total,			.	.	.	.	.	.	.	.	80

A mere glance at these figures, I think, shows conclusively the futility of any attempt at a close classification. Furthermore, it is impossible to assign any special pollen as the active irritant in any of the above classes, inasmuch as definite facts of this character could be ascertained only by very close personal experimentation and observation, and of this few patients are capable. It should be added, moreover, in regard to these cases, that it is exceedingly difficult to elicit an accurate clinical history from the patients without close questioning, and even then the principal points of the histories which an inquirer desires to ascertain are but vague impressions; hence their answers will be of a very general and indeterminate character, based on an imperfect recollection of their last annual attack.

The above figures refer to the disease as manifested in America. In England it usually appears in May and June and rarely lasts into September. The same is true of France, Germany, and other European countries. The autumnal variety of the disease would seem then to be exclusively American. An interesting question in this connection arises as to whether the disease is not greatly on the increase. Personally, I am inclined to think so. This belief is based not only on the fact that a larger number of cases come under my own personal observation each year, but on the increased severity of the symptoms observed to develop year by year; as, in many instances, a patient hitherto suffering from a mild rose cold in the early summer will now have in addition an autumnal attack; and, furthermore, patients hitherto suffering merely from the influenza commence now to suffer, in addition, from hay asthma as well.

It might be stated here, in regard to my own cases, that they are entirely made up of patients in my own private practice, and,

furthermore, that whereas I have reported but eighty, quite a large number are not included, owing to the fact that the recorded histories are incomplete.

Geographical Distribution of the Disease.—Wyman attempted to show that the disease was limited to certain areas. A larger familiarity with the disease, I think, demonstrates that Wyman's conclusions were based on insufficient research, and that we shall find hay fever prevalent throughout the whole United States, with the exception of certain elevated districts, such as the White Mountains, the Adirondacks, and a portion of the Southern States. That the territory west of the Mississippi is to a certain extent exempt is explained by Beard on the ground of the lack of vegetation, and the sparsity of population in these immense districts. This immunity, however, is disappearing rapidly each year, as there is nothing in the flora or the climate of the West which affords exemption from the disease, for, as population extends, and urban life increases, the diseases of civilization become more common.

It is also a noticeable fact that some parts of the White Mountains which have hitherto been classed among the exempt regions have failed in late years to give that complete relief which patients have formerly enjoyed there. This is probably due to the extension of the railroads, which have increased the amount of travel and, as a consequence probably, extended to a degree the flora of the valleys.

Diagnosis.—The disease, it is well known, is not infrequently looked upon as summer cold and its periodicity overlooked. A mistake in diagnosis, however, need never be made, for there are certain characteristics which distinguish it in a marked way from an ordinary attack of acute rhinitis. These are the comparative suddenness of its onset, as well as its disappearance, together with the peculiar symptoms which characterize its progress, which are the violent sneezing and profuse watery discharge. Now, in an ordinary acute rhinitis, the stage of the disease which is accompanied by a serous discharge from the nose is of comparatively short duration, whereas in hay fever this feature of the disease continues during the whole course of the attack. Moreover, in a cold in the head, intense sneezing lasts but a few days and does not occur in the violent paroxysms characteristic of hay fever. The appearances of the membrane on examination, moreover, are totally distinct in the two affections. In acute rhinitis the membrane is red, highly congested, and pours forth a more or less profuse mucous or muco-pus discharge, in connection with the serous exudation, which is seen coating its surface in yellowish semi-opaque flakes or masses. In hay fever, on the other hand, the membrane, although swollen, never presents the

bright-red appearance of an acute inflammation, but is of a bluish-gray tinge, verging on opalescence. This is due to the fact that the hyperæmia is confined entirely to the large venous sinuses which comprise the turbinated bodies, the capillaries of the mucous membrane proper not being congested. In addition to this, the surface of the membrane is covered with slightly viscid watery serum, which gives it a glassy semi-translucent aspect. The swollen condition of the membrane gives rise to more or less complete occlusion of the nasal cavity, the turbinated bodies lying in contact with the septum. At these points of contact, little bridges of viscous serum will be noticed stretching across from one side to the other, giving the appearance of air bubbles as it were. Posterior rhinoscopy adds little to our information, other than showing the posterior nares occluded by the swollen grayish membrane covering the turbinated bodies posteriorly. Suffusion of the eyes, with photophobia and epiphora, afford a certain amount of diagnostic information, although those may occur in connection with an ordinary cold in the head.

Prognosis.—Hay fever rarely involves any marked impairment of the general health, and hence the prognosis is never grave. The main question of interest, however, is whether the disease can be cured. It is a noticeable fact in the voluminous literature on this subject that this feature of the diseasse has received but slight consideration. In a certain proportion of cases the disease seems to disappear spontaneously, from no apparent cause. This tendency is, however, manifested in but a small proportion of cases. As before noted, eighty cases have come under my personal observation and treatment, while four additional cases have come under treatment for a diseased condition of the upper air passages, who had in previous years suffered from annual attacks of hay fever. This perhaps will fairly represent the proportion of cases in which we may expect this spontaneous disappearance of the affection. In discussing the question of causation, eighty cases were analyzed in which the disease was periodical, and the histories fully ascertained. I have, however, comparatively full records of one hundred and twenty-one cases. Of this number there were:

Cured,	51
Relieved,	43
Unrelieved,	13
Results unknown,	14

The above tables embrace all the cases of vasomotor rhinitis that have come under my observation, including not only the periodical cases, such as autumnal fever and rose cold, but a large number of patients in whom the symptoms were perennial. Roe presents

statistics even more favorable than these, in that of forty-four cases under treatment thirty-six were cured, although in sixteen of the thirty-six there was some return of the symptoms.

The duration of the disease apparently has no influence on the prognosis, for the case of a year's standing will often prove quite as obstinate to treatment as one of twenty or even thirty years' standing. We would naturally suppose that where hay fever has led to the development of hay asthma, the neurotic habit was so firmly fixed in the individual as to render the prognosis more grave; and yet this is not true, as is shown by an analysis made by the writer of eighty cases of asthma. Thirty-four of these cases were of hay asthma, and of these eighteen were cured, fourteen relieved, one was lost sight of, and in one treatment was apparently without effect. The prognosis in hay asthma would therefore seem to be more favorable even than in hay fever. Age, I think, has an undoubted influence on prognosis, in that for younger patients a more favorable prognosis can be given.

We are not warranted in giving an absolutely favorable prognosis in any individual case, and yet I think statistics justify us in the expectation that a large proportion of cases can be cured.

Treatment.—The treatment of hay fever consists in:

First.—General treatment, for the correction of the neurotic habit.

Second.—Local treatment, for the relief of the diseased condition of the upper air passages.

Third.—The treatment of the exacerbation.

First. Constitutional Treatment.—The efficacy of internal medication was recognized very early in the history of this disease, and the list of drugs which we find recommended for the correction of the neurotic habit embraces a large proportion of the so-called nervines, as well as many of the anodynes. Among these we include belladonna, zinc, arsenic, phosphorus, strychnine, hydrocyanic acid, valerian, assafœtida, musk, lobelia, amber, the bromides and iodides, chloral, opium, hyoscyamus, quinine, and the various preparations of iron.

The usual method of administration of these drugs is to commence with small doses from two to four weeks before the annual attack sets in, gradually increasing the dose to get the patient thoroughly under the influence of the drug by the time the paroxysm comes on, and to continue its administration while the attack lasts. Long before the essential pathological lesion which characterizes an attack of hay asthma was recognized, the use of belladonna was resorted to as an antispasmodic. That belladonna exercises a notable influence in controlling the manifestations of this disease has been confirmed by most observers. Dechambre advised that it should be given in gradually increasing doses until its full physiological effect was obtained,

after which the doses should be slowly decreased. This, however, was during the attack. Better results I think are obtained by commencing the administration of the remedy three or four weeks before the attack, and continuing it until its termination. Mackenzie has found "valerianate of zinc in combination with assafœtida more valuable than any other drug." He commences with the administration of one grain of the zinc, in combination with two grains of compound asafœtida pill, before the attack comes on, and at the end of two weeks doubles the dose. I fully believe in the therapeutic value of the salts of zinc in this affection, but regard belladonna as far more efficacious and certain in its action. No combination in my own experience has been attended with better results than the administration of both these remedies as in the following:

℞ Zinci phosphidi, ... gr. viij.
Extract. belladonnæ, ... gr. x.
M. ft. mass. in pill. no. xl. div. S. One pill three times a day after eating.

Most cases of hay fever show no evidence of impaired nutrition, but, on the contrary, I think the rule is that they present every evidence of vigorous general health. When, however, there is evidence of impaired nutrition, I think the administration of arsenic is often attended with the best of results, and in these cases the above formula can be amended as follows:

℞ Zinci phosphidi, ... gr. viij.
Acidi arseniosi, ... gr. i.
M. ft. mass. in pill. no. xl. div. S. One pill after each meal.

Or, again, in certain cases I have combined the three drugs in the same prescription in the above proportions.

As noted above, most writers tell us to commence the administration of constitutional remedies three or four weeks before the hay-fever season. This is not the time, as a rule, when the patient comes under observation; in fact, I think in most instances they come during the attack, or just after it; and this it seems to me is by far the better time to commence treatment, for, as already intimated, I regard local measures of treatment as of more importance than constitutional. I think, therefore, the time to administer internal remedies for the correction of the general habit is at the same time at which our local treatment is instituted. The general neurosis which requires correction exists during the whole year, and certainly, if the case is one of autumnal fever, the winter or early spring months are quite as favorable to commence treatment as midsummer. If one were to choose the season, however, for treating these patients, I think perhaps the preference might be given to the early summer months, when the

warm dry atmospheric conditions are at least unfavorable to catarrhal disease involving the upper air passages. As regards the other drugs of the long list above enumerated, I have but limited experience and little faith in their value.

There are certain general hygienic measures, which are of undoubted importance, such as the regulation of the clothing and the habits of life. These have already been sufficiently elaborated in previous chapters. There is, however, one measure which I regard as of the greatest importance. This consists in the use of the cold douche on the spine. A sponge bath is not sufficient. The end to be accomplished is the general tonic effect on the central nervous system which is produced by the sudden and decided shock of cold water down the spine. The cold shower bath accomplishes the purpose in an admirable manner, and yet this is not always tolerated by the patient. I have rarely, however, seen a patient who could not endure easily the cold douche confined to the spine alone.

Such other treatment as may be required during an attack is simply that which would be suggested by the general laws which govern the administration of drugs for the control of such symptoms as may be presented. Of these opium is undoubtedly the most valuable, both to allay the nervous irritability and for procuring sleep. Mackenzie gives preference to the tincture over any other preparation, giving small doses, of from five to seven drops, twice daily. This, however, as a rule, should be governed by the tolerance and preference of the patient. In many cases, the best action of the drug would be secured by the hypodermatic administration of morphine, as recommended by Moorhead, who first used in this manner $\frac{1}{20}$ of a grain of morphine, with $\frac{1}{200}$ of a grain of atropine twice daily, but subsequently found his best results from the administration of $\frac{1}{20}$ of a grain of the tartrate of morphine twice daily, increasing the dose, as the attack developed, to $\frac{1}{10}$ of a grain three times daily.

Opium undoubtedly does more than control the general condition, in that it goes far to modify the severity of the local symptoms. No physician, however, should take the responsibility of administering to a patient $\frac{1}{10}$ of a grain of morphine three times daily through the three months of a hay-fever exacerbation without recognizing the exceeding great danger the patient incurs of contracting the opium habit. While, therefore, opium is undoubtedly among the most efficacious of our constitutional remedies during an exacerbation, I think it well to depend mainly on less dangerous anodynes, such as hyoscyamus, or the bromides, alone or in combination with chloral.

Second. Treatment of the Diseased Condition of the Upper Air Passages.—If the view maintained in discussing the causation of hay

fever be correct, that in all cases a powerful predisposing cause lies in a diseased condition of the upper air passages, it necessarily follows that by far the most important feature of treatment consists in the removal of the morbid local lesion.

The special affections which act as predisposing causes of hay fever are hypertrophic rhinitis, naso-pharyngeal catarrh, deflections of the septum, nasal polypi, and indeed any obstructive lesion in the nose which tends to produce a chronic turgescence of the blood-vessels. When we include naso-pharyngeal catarrh among the local exciting causes of the disease, and as one constituting an obstructive lesion, it is to be understood that we refer to the very intimate and close sympathy which we find existing between the nose and the naso-pharynx, under the action of which a morbid process in the latter region seems to act as the immediately exciting cause of a hyperæmic condition of the turbinated tissues, this latter being the directly predisposing cause of the hay-fever exacerbation. The special indications for treatment are to be sought by careful investigation and diagnosis of each individual case, and such lesion as may be found is to be treated according to the rules laid down in a previous chapter. If nasal polypi or other tumors are discovered, they should be extirpated; if a deflection of the septum exists, the obstructing portion should be removed. If hypertrophy or chronic hyperæmia is discovered, these conditions should be reduced in the manner already described. In brief, the essential requirements of treatment demand that the whole of the upper air tract be restored to a condition of normal patency. Sajous, in his interesting monograph, takes the ground that the cauterization of the nasal mucous membrane results in an alteration of superficial nutrition. I am disposed to think that the excellent results which Sajous obtained from treatment were really in subduing turgescence and reducing the hypertrophied membrane. Sajous, writing at a later date, lays special emphasis on the necessity of confining his caustic applications to the sensitive areas, having previously determined these by means of the cold probe, following the method previously described by John Mackenzie. The sensitive areas in the nose described by John Mackenzie I have never been able to definitely locate as such, and still adhere to the belief that the indications for treatment are the reduction of inflammation and the removal of obstructive lesions, and not the control of a hyperæsthetic condition in the nose. I think it is a more rational view that the success in treatment undoubtedly obtained by the advocates of the sensitive-area theory by means of cauterization is directly due to a reduction of inflammation and diminution of blood supply.

Third. Treatment of the Exacerbation.—The early recognition of the fact that floating pollen in the atmosphere was the exciting cause of the attack led to attempts to protect the mucous membranes from its impact. I have never had much faith in the efficacy of respirators or veils, and, furthermore, the discomfort of wearing them during the whole of the hay-fever season would be so great that many patients would prefer to risk the exposure to the pollen. No local remedy that has ever been used for the relief of an exacerbation of hay fever is comparable to cocaine, both as regards the certainty and promptness of its action and the completeness of the relief afforded. I have made use of it in cases of hay fever as well as in other nasal disorders characterized by vascular turgescence, and have found it to give complete relief from all the symptoms for the time. This action of cocaine in hay fever I attribute purely to its property of contracting the blood-vessels, for the hay-fever symptoms abate as soon as the vascular turgescence is allayed. It has been charged, notably by Beverley Robinson, that after the vascular distention has been subdued by cocaine the relief is but temporary, and is followed by a reaction in which the distressing nasal stenosis is even greater than before. I have used the drug very extensively since its introduction, and recall but three instances in which any such reaction was observed. As before stated, the relief is prompt and efficient, although not permanent, lasting but from two to three hours, when relaxation of the blood-vessels occurs, demanding a second application. The formula which I usually give is as follows:

℞ Cocain. hydrochlorat.,		gr. xx.
Sodii bicarb.,		
Acidi borici,	āā	gr. x.
Aquæ,	℥	i.

M. ft. sol.

This is to be used by means of the small hand atomizer shown in Fig. 19 or any small cologne atomizer such as is sold in the drug stores. The patient is directed to apply this freely to the nasal cavities as often as may be necessary to control the symptoms. The above solution, as will be seen, is about a four-per-cent. solution. It is well to mention this to the patient, directing him to reduce the strength until he finds what, in his own experience, is the weakest solution which may be used and still give relief. In many instances I have found that even a one-half-per-cent. solution was quite as efficacious as the preparation given above, and of course it is always desirable that the end should be acomplished with as weak a preparation as possible. An excellent method of administering cocaine is as follows:

℞ Cocain. hydrochlor., ... gr. x.
Aquæ, ... q. s.
M. ft. sol.
Addc
Fluid cosmoline vel
Ol. voschano, ... ℥ i.
Shake well before using.

This is to be used in the atomizer shown in Fig. 18. It is perhaps a less convenient form than the watery solution, but the cosmoline affords a grateful and soothing application to the mucous membrane, while the cocaine exercises the same action as in the watery solution. Mackenzie recommends the use of gelatin bougies containing $\frac{1}{10}$ of a grain of cocaine combined with $\frac{1}{120}$ of a grain of atropine. These are to be inserted into the nasal passages by the patient, and allowed to remain there until they melt. This method of application is uncleanly, and, furthermore, is not thorough. I think the application to the middle turbinated bodies is even more important than to the lower, and certainly patients suffering from hay fever would not tolerate the insertion of a bougie into the middle meatus. The same objection, I think, lies against all suppositories of cocaine, as well as the gelatin discs and other preparations of the sort. Insufflations of powders are not open to this objection and are to be recommended as follows:

℞ Cocain. hydrochlorat., ... gr. x.
Bismuthi subcarb., ... ʒ i.
Magnesiæ carb. lev., ... ʒ ij.
M.

Or,

℞ Hydrarg. chloridi mitis, ... gr. v.
Cocain. hydrochlorat., ... gr. x.
Sacch. lac., ... ʒ iij.
M.

The addition of morphine to one of these powders is always grateful to the patient, but a combination of morphine with cocaine should always be used judiciously. Keeping this in view, the following may be used:

℞ Morphinæ tartratis, ... gr. i.
Cocain. hydrochlorat., ... gr. x.
Sulphuri flor., ... ʒ ss.
Sacch. lac., ... ʒ iiss.

The only objection to the use of a snuff is that we do not, as a rule, get the same thorough penetration of the nasal cavities as by means of the atomizer.

The ocular symptoms, being due quite as much to the direct

impact of the pollen upon the cornea and conjunctiva as to sympathetic action, are to be relieved by the same local applications which are applied to the nasal cavity, although with this proviso, in applying cocaine to the eye, the solution should not be stronger than one per cent. If, however, the eye is well protected by colored glasses in most instances the relief will be such as to render local applications unnecessary. Cheatham makes the very excellent suggestion that eserine, in the strength of $\frac{1}{12}$ of a grain to the ounce, should be added to the cocaine solution in order to prevent the dilatation of the pupil.

CHAPTER XV.

ASTHMA, OR VASOMOTOR BRONCHITIS.

Asthma is a disease characterized by dyspnœa, both inspiratory and expiratory. The diurnal character of the disease is shown by the recurrence of the attacks at certain times during each twenty-four hours, usually at night and lasting for some hours. The seasonal character of the attack manifests itself in the disposition of the symptoms to undergo complete relief at certain periods of the year, usually the warm dry months of summer, and, in a less degree, the dry cold months of winter.

Etiology.—The first to write a really exhaustive work on asthma was Henry Hyde Salter, who makes the following propositions:

First. Asthma is essentially, perhaps with the exception of a single class of cases, a nervous disease, the nerve centres being the seat of the essential pathological condition. *Second.* The phenomena of asthma, distressing sensation and demand for extraordinary respiratory efforts, immediately depend upon spasmodic contraction of the cells of unstriped muscular fibre in the bronchial tubes. *Third.* The phenomena are excito-motor or reflex actions. *Fourth.* The extent to which the nervous system is involved differs much in different cases, being, in some, restricted to the nervous apparatus of the air passages themselves. *Fifth.* In a large number of cases, the pneumogastric, both gastric and pulmonary portions, is the seat of the disease. *Sixth.* In a large class of cases the nervous circuit involves other nerves besides the pneumogastric. *Seventh.* There is still another class of cases in which the irritation is central. *Eighth.* In a certain proportion of cases the irritation is humoral.

We see, then, that, according to Salter, asthma is essentially a neurotic disease, and this theory, with some modifications, is the one adopted at the present day.

The series of phenomena found in asthma is explained by certain writers on the theory that the dyspnœa is due to the contraction of certain muscular fibres which anatomists have demonstrated as existing in the bronchial tubes, down to their smallest ramifications. It seems rather curious that this theory should not long ago have been

questioned. All observers very properly recognize asthma as a neurotic disease, and muscular spasm is undoubtedly a manifestation of the neurotic temperament, and apparently on this trivial ground the theory has been accepted.

In 1872, however, we find the spasm theory called in question, and what, to my mind, is a far more plausible one advanced by Weber, who was the first to teach us that the cause of the paroxysm lay in a paresis of the vasomotor nerves presiding over the vessels of the bronchial mucous membrane. Under the influence of this vasomotor paralysis there occurs, from some cause, a sudden letting up of the control which is exercised over the calibre of the blood-vessels, whereupon they become distended to such an extent as markedly to interfere with the passage of air through the bronchial tubes. This paralytic condition having lasted several hours, the membrane maintaining a dry condition, as is always the case in the first stage of the inflammatory processes, there follows an escape of serum and sero-mucus, thus relieving the engorged blood-vessels, which soon regain their normal calibre, coincident with the cessation of the paroxysm. We thus have a thoroughly rational theory in explanation of the symptoms of spasmodic asthma. As to the causes, however, of the disease, little has been said, further than the enumeration of the causes already stated, as laid down by Salter. Weber's paper, however, was followed by a series of clinical observations, which lent considerable weight to his theory and also threw much light on the causes of the disease. These observations were followed by a large number of similar reports from others, and gave rise to discussions on asthma as a reflex disease due to nasal polpyi and other nasal disorders.

In a paper read before the American Climatological Association, May 28th, 1885, I first advanced the view that hay fever and perennial asthma were virtually one and the same disease, the one being a vasomotor rhinitis, the other being a vasomotor bronchitis, the paroxysms being excited, in each case, by some peculiar atmospheric condition. The atmospheric condition, as we know, in hay fever is the presence of the pollen of flowering plants, or some other vegetable emanation; whereas the atmospheric condition in perennial asthma, as we may designate those cases of asthma which occur during the whole year and do not depend upon hay fever, is dependent upon some obscure element which we are, as yet, unable to trace with the same degree of definiteness as we are enabled to trace it in hay fever. Hay fever is dependent upon three conditions:

First. A neurotic habit, as was conclusively shown by Beard.

Second. The presence of pollen in the atmosphere, as shown by the unrivalled experiments of Blackley.

Third. A disordered condition of the nasal passages, as shown by Daly.

Now, the view that I advocate is that asthma also is dependent on three conditions:

First. A general neurotic condition, as demonstrated by Salter.

Second. A diseased condition of the nasal mucous membrane (not the bronchial).

Third. Some obscure condition of the atmosphere exciting the paroxysms.

The view as regards the neurotic condition is generally accepted; that as regards the atmospheric condition, I think, is one which must be generally accepted by all observers, when we consider the diurnal and seasonal periodicity of the paroxysms. As regards the nasal condition as a predisposing cause of the attacks, the view is a novel one, and, naturally, would be looked upon as the hobby of a specialist. In my original paper I made this assertion, that "a large majority, if not all, cases of asthma were dependent upon some obstructive lesion in the nasal cavity. This is evidenced by the immediate relief from the exacerbation by the use of cocaine in the nose in every case in which I have tried it, and, furthermore, by the cure of so many cases by the removal of the obstructive lesion in the upper air passages."

This paper was read some years ago. The views there stated I would repeat with even more emphasis, for subsequent clinical observation has only served to confirm me in my belief of their correctness.

In looking over my notes, I find I have recorded histories of eighty cases of asthmatics. A prominent feature in the analysis of these records is the preponderance of cases which show a decided neurotic family history; twenty-five of the thirty cases of hay asthma being of inherited neurotic habit, in which the history is known, while in the perennial form sixteen of the twenty-eight cases, in which the history is ascertained, show the neurotic tendency.

The tables also show that the largest number of cases of asthma, in both forms, develops during the third decade of life, while no period is notably exempt. This differs from Salter, who states that most cases develop during the first decade.

It was noticed that whereas, in hay fever, the seashore afforded the greatest relief, after asthmatic symptoms had set in, the same rule applied to both forms, and that high altitudes were most beneficial; and yet, I think, no rule can be formulated for the cases as a class.

The following, it seems to me, is of the greatest importance, as sustaining the original assertion made in the first part of the chapter:

Hay Asthma.

Nasal symptoms immediately preceding attack, such as sneezing with watery discharge from the nose,	29
No symptoms preceding attack,	5
Total,	34

Perennial Asthma.

Nasal symptoms preceding attack,	33
No nasal symptoms preceding attack,	12
Cutaneous eruption preceding attack,	1
Total,	46

It should be mentioned that many patients entirely ignore the nasal symptoms, in the greater discomfort arising from the dyspnœic attack, and only recall them when their attention is turned in that direction. We see, then, that of the eighty cases, the asthmatic attack set in with sneezing, etc., in sixty-two.

Of the eighty cases, fifty-four gave a history of previous catarrhal trouble. Yet the testimony of patients in this matter is not to be relied upon, as many patients have undoubtedly notable impairment of the nasal respiratory function without being conscious of suffering from what they call catarrh. Moreover, in a large proportion of nasal disorders, the symptoms are referred, by the individual, to the throat, while "catarrh" is popularly referred to the nose.

Intranasal Condition—Hay Asthma.

Hypertrophic rhinitis,	9
" " and deflected septum,	12
Polypi and deflected septum,	5
Polypi,	4
Deflected septum,	3
Elongated uvula,	1
Total,	34

Intranasal Condition—Perennial Asthma.

Hypertrophic rhinitis,	13
Nasal polypi,	11
Hypertrophic rhinitis and deflected septum,	11
Polypi and deflected septum,	6
Deflected septum,	3
Adenoid and hypertrophic rhinitis,	2
Total,	46

I have never known a case of hay fever or asthma to occur in other than an obstructive lesion of the nose or upper air passages, as will be seen by this table; this was true of every one of the eighty cases, including that of the elongated uvula, which became a source of respiratory obstruction.

TREATMENT—HAY ASTHMA.

Hypertrophic rhinitis, treatment by caustics:
Cured, 7; improved, 6; unimproved, 1.
Deflected septum, operated on by author's nasal saw:
Cured, 8; improved, 6.
Nasal polypi treated by snare, without caustics:
Cured, 2; improved, 1.
Treatment by snare and septal saw in cases of polypi and deflected septum:
Cured, 1; improved, 1.
Cases treated by uvulotomy:
Cured, 1.

TREATMENT—PERENNIAL ASTHMA.

Hypertrophic rhinitis, treated by caustics:
Cured, 8; improved, 5.
Polypi treated by snare, without caustics:
Cured, 15; improved, 3.
Deflection of septum operated on by author's nasal saw:
Cured, 3; improved, 4; unimproved, 1.
Adenoid growths removed by snare:
Cured, 2.

The treatment, as will be seen, has been such as our English friends regard as harsh and in many cases unwarranted. I think it but justice to say that, in some cases, patients have been unwilling to continue on account of this, and yet, with the use of local anæsthesia, these operations are not painful; it is the nervous strain, on this class of patients, which has taxed them most serverely. That the surgical treatment of nasal diseases is fully justified I think the following table amply demonstrates:

RESULTS OF TREATMENT—HAY ASTHMA.

Cured,	19
Improved,	14
Unimproved,	1
Unknown,	0
Total,	34

RESULTS OF TREATMENT—PERENNIAL ASTHMA.

Cured,	28
Improved,	12
Unimproved,	1
Unknown,	5
Total,	46

I have thus given all the results obtained from the analysis of my cases, as bearing not only on etiology but also on other branches of this subject. The point upon which I wish to lay special emphasis here is the very close and intimate physiological and pathological connection between the nasal mucous membrane and that lining the

bronchial tubes, and the further fact that in asthma we must look for the active predisposing cause of the attack in a diseased condition of the nasal mucous membrane. In the above statistics we have included hay asthma and perennial asthma, considering these two affections as virtually one and the same disease, from a clinical point of view. This is shown by the fact that in many instances they are interchangeable, in that a patient may suffer a number of times from hay fever without developing asthmatic attacks; finally, however, his hay-fever paroxysm winds up with an attack of true nervous asthma, a still further change consisting in the cessation of the hay-fever attacks, and the patient becoming subject merely to attacks of perennial asthma. This fact I have noticed in quite a number of instances.

As regards the remote causes of perennial asthma, then, I think we must recognize the fact that even in this there must be in many cases some local disorder of the nasal cavities which leads to the development of the reflex disturbance; otherwise the presence of worms in the intestinal canal or other disturbing influences would scarcely result in the development of an attack of asthma. We have already shown the intimate physiological connection between the nasal mucous membrane and that of the bronchial tubes, and that a weakened condition of the passages above tends to develop a similar condition in the parts below. I think, therefore, we must recognize in all these unusual reflexes this tendency of vasomotor weakness of the bronchial tubes, under the action of which worms in the intestinal canal, undigested food in the stomach, and other causes may produce an asthmatic attack. Perhaps it would be not wise to say that a pathological intranasal condition is present in every one of these cases of obscure reflexes, and yet I think it is still less wise to accept evidence of cardiac lesion or of gastric disturbance as presenting a sufficient cause of the attack without also examining the nasal cavities to ascertain whether some lesion may not also exist there.

The disease being essentially a neurosis, we would naturally expect to find heredity exercising a notable influence, a fact which all statistics fully bear out, in that this disease, as well as hay fever, seems to run in families, as it were. The influence of age and sex has already been clearly shown in the statistics given. The possible existence of a rheumatic or gouty diathesis should not of course be overlooked as factors in the development of these attacks. How they should act it is impossible to say, and yet, here as before, I still think the possible existence of a predisposing nasal disorder should not be overlooked. We regard, then, an intranasal disorder as not only a powerful predisposing but exciting cause of an attack of asthma. It should be stated, however, that when we speak of pathological intra-

nasal conditions we include not only a diseased condition of the nasal cavity but also of the naso-pharynx.

Symptomatology.—A paroxysm of asthma usually occurs at night, and perhaps in the majority of instances during sleeping-hours. A patient retires without any premonition of danger and is awakened by a most distressing dyspnœa. He springs from his bed, terrified and gasping for breath. His face is turgid, eyes protruded, mouth open, with the perspiration starting upon his face. The dyspnœa is both inspiratory and expiratory; inspiration being shorter and somewhat quicker in that it is aided by all the voluntary and involuntary muscles of respiration, while the expiration is somewhat prolonged in that the patient apparently seeks a momentary period of rest, in allowing such air as he has drawn into the lungs to escape voluntarily. Whereas the dyspnœa characterizes both acts of inspiration and expiration, the muscular struggle is largely expended on the inspiratory act. The pulse is ordinarily somewhat rapid and weak, especially if the paroxysm is prolonged. The temperature usually falls somewhat below the normal, due probably to the fact of insufficient oxygenation. This represents a typical and well-developed attack of asthma which may last for from one to two, three, or four hours, and in rare cases may persist from one to three days. When the paroxysm comes on during waking hours, in the large majority of instances it commences with sneezing and watery discharge from the nose, which may be of such a character as to give considerable annoyance to the patient, or be so slight as to scarcely excite attention.

In that form of asthma which occurs in connection with hay fever, of course, the attacks are confined only to the hay-fever season, but in the ordinary form of asthma, which we have already designated as perennial, the attacks are usually aggravated by the damp atmosphere of the spring and fall, the patient enjoying a certain degree of immunity during the clear cold weather of winter and the warm weather of summer.

The character of the paroxysm is also notably influenced by the changes in weather. In the midst of the bad season the attacks may be arrested by a change to a dryer climate, especially to high altitudes, where an atmosphere is encountered which seems exceedingly favorable in its influence upon these cases. In most of these patients, also, a peculiar hyperæsthetic condition of the whole upper air tract is present, evidenced by the fact that the presence of irritating vapors, dust, gases, etc., will produce a temporary sense of dyspnœa or even a well-marked paroxysm of asthma, which, however, usually disappears promptly on the removal of the exciting cause. The cessation of the paroxysm is usually attended with a more or less profuse sero-mucous

discharge, the clinical significance of which has already been fully discussed in the statement that this is due to the unloading of the engorged blood-vessels by a serous exosmosis, by means of which their calibre is diminished and thereby the patency of the bronchial tubes restored.

Physical Signs.—On inspection of the chest during a paroxysm, the first noticeable feature will be the very marked impairment of motion, in that the whole chest wall seems somewhat rigid and to move together. This, however, is to an extent deceptive, the limited movement of the chest being really due to the limited amount of air which is drawn in with each act of inspiration. Percussion simply reveals perhaps a slight exaggeration of normal resonance. The diagnosis, of course, is based entirely on auscultation, by means of which there will be recognized the characteristic sibilant and sonorous râles throughout the whole of the chest cavity and heard equally at any point. These are blowing, purring, whistling, cooing sounds, that are caused by the passage of air through the narrowed tubes of various calibres, the walls of which are perfectly dry. In other words, there is total absence of any moisture, but the mingling of dry râles constitutes a confusion of musical sounds, as it were, which can be likened to nothing so much as the cooing of a flock of pigeons. So loud are these sounds that they can be heard frequently even across the room. The normal respiratory murmur is of course completely masked by these loud râles, which are heard both in inspiration and expiration, although, as before stated, the expiratory sounds are somewhat prolonged. At the termination of the paroxysm, the dry râles diminish in intensity and to an extent disappear. The moist râles may now be heard, as the serum transudes the blood-vessels and makes its appearance in the bronchial tubes.

Prognosis.—Asthmatic patients are said to be long-lived, which is probably true, in that there is nothing in the disease itself which would tend to shorten life. During attacks the sufferings of the patient are extreme, but during the intervals he enjoys ordinarily the best of health, excluding, of course, those cases which are dependent upon a chronic bronchitis, which, as before stated, is not to be classified with nervous asthma. As regards the disease itself, however, the prognosis, of course, depends largely on our ability to control it. From the analysis of cases given above it would seem that the plan of treatment carried out in these affords us a method of controlling the severity of attacks in the large majority of instances, and in a very flattering proportion of cases of radically curing the disease.

Treatment.—The consideration of the treatment of this disease naturally divides itself into three heads, namely:

1. The treatment of the local predisposing cause, which, as we have endeavored to show, consists of a morbid condition of some portion of the upper air tract.

2. The treatment of the paroxysm.

3. The constitutional treatment, or the treatment of the general neurotic habit.

The Treatment of the Local Morbid Condition in the Upper Air Passages.—We place this first in importance, in that, as has already been intimated, we regard these measures not only as the first to be instituted, but as those which promise the best and surest results, and even in those cases in which local treatment fails to thoroughly relieve the disease we certainly have prepared the way for the better action of general remedies. In resorting to these local remedies, we search not only the nasal cavities but the cavity of the naso-pharynx for the local predisposing cause, but the measures of treatment are to be first directed to the nasal pasages proper, for the reason that, as has already been intimated, we find in the large proportion of cases that the morbid condition of the naso-pharynx disappears upon the restoration of the nasal passages to a healthy condition of patency and its lining membrane to a normal condition of functional activity.

The Treatment of the Paroxysm.—I have endeavored, in a former chapter, to make clear the intimate sympathy which exists between the nasal and bronchial mucous membrane, and to show how a plethoric condition in one region is exceedingly prone to be acccompanied by a similar condition in the other. A large clinical experience has shown me that we possess few remedies more active or more certain in their action than cocaine. This, therefore, should be our first resort. It may be applied by means of the small atomizer, shown in Fig. 19, or, failing this, an ordinary dropper answers an excellent purpose, a small amount being applied to each nostril and repeated every five minutes until relief is afforded. In my own hands, I have seen but few cases in which this remedy was not notably successful.

Next in importance to this, we should place datura stramonium. This drug is used by burning the leaves and inhaling the smoke, this procedure being accomplished by smoking the leaves in a pipe, or in the form of a cigarette, or simply by burning them on a plate. Clinical experience, however, teaches us that the fumes of the leaves have a very powerful effect in controlling the distressing features of an asthmatic paroxysm, and, although probably, in the majority of instances, they fail to afford perfect and entire relief, they rob the attack of much of its distressing character.

Another remedy of great efficacy is the fumes of burning saltpetre. While perhaps not so efficacious as the stramonium, the saltpetre is a

remedy which rarely fails to afford a certain amount of relief. The combination of these two remedies is one which enters largely into the manufacture of a large proportion of the asthma remedies sold in the drug stores.

Still other remedies which possess a certain amount of popularity for use in this manner, are datura tatula, datura fatuosa, metêl, belladonna, opium, hyoscyamus, arsenic, etc. These, however, are generally used in combination with the stramonium and potash, as in the well-known Espic's cigarettes.

It is a curious feature in the clinical history of asthmatics that the efficacy of every remedy seems to exhaust itself, to a certain extent. This is not due, I think, to any tolerance produced by the drug, but rather to the fact that the longer the disease lasts, and the more fixed the asthmatic habit becomes in an individual, the greater the difficulty in affording relief to a paroxysm. In other words, the morbid lesion which constitutes a paroxysm being a relaxation of the blood-vessels, their tonicity or power to recontract seems to be lessened, according as the disease persists for a lengthy period of time. Hence, any of the above simple remedies may occasionally fail to afford relief, and it will become necessary to resort to internal medication. Of internal remedies, undoubtedly the most efficacious is opium. This should be administered, when necessity demands, in the form of morphine and given hypodermatically, as securing the promptest effect of the drug, in doses of one-eighth to one-sixteenth of a grain, repeated hourly until relief is afforded. Chloral in doses of fifteen to twenty grains, repeated every three hours until sleep is produced, or in twenty to thirty grain doses repeated twice during the night, will usually give relief, especially if combined with an equal amount of bromide of potassium. If the paroxysms be very severe, we may resort to the administration of chloroform or ether, although these remedies should be used with a certain amount of hesitation and with the anticipation of giving but temporary relief. The latter is especially objectionable, on account of its peculiar irritating action upon the mucous membrane of the upper air passages. The use of nitrite of amyl has fallen into disuse, on account of the very distressing symptoms referable to the head to which it gives rise. In the same category we may place the iodide of ethyl.

The use of the galvanic current has been recommended for the relief of the asthmatic paroxysm by Caspari, and it is an excellent suggestion, although scarcely available in most instances. We have thus given, somewhat in the order of preference, the various measures to which we may resort in our attempts to relieve the paroxysm, all of which undoubtedly possess notable merit, and yet, as a rule, I

think we shall secure, in most instances, the best results from the simple measures first enumerated, notably the local application of cocaine and the inhalation of the fumes of stramonium and nitrate of potash, in some one of their various combinations.

General Treatment.—While I believe the local treatment of a diseased condition of the air passages the most important part of our therapeutic measures, none will question the marked effect of the internal administration of drugs in this disease. Hence I think we are rarely justified in depending entirely on local measures alone, but when our patients first come under observation they should be immediately put on a course of internal medication also. Of internal remedies, the one experience has shown us to possess the most notable efficacy in the control of asthma, is undoubtedly iodide of potassium. The best plan for its administration is to give ten grains well diluted in wine or water, three times daily after meals for from five to seven days, after which the dose may be doubled and continued for an equal period. When iodism is produced, as evidenced by the metallic taste in the mouth, the dose should be reduced to seven grains three times a day for a somewhat long period of time, occasionally interrupting its administration for a day or two, but still continuing to give it for a prolonged period, or until its efficacy has been thoroughly tested. In late years there have come into use two remedies which possess noted value; these are grindelia robusta and quebracho. We find, however, that the constitutional treatment of this disease will depend, so far as internal medication is concerned, largely upon the administration of iodide of potassium, after the manner above detailed.

Our systemic treatment, however, is not necessarily confined to the administration of drugs, for very much can be accomplished by certain general hygienic rules. The most important of these is the daily use of the cold bath, either in the form of a plunge or shower, or, when this is not tolerated, the daily sponging of the skin. In addition to this careful attention must be paid to those general rules of living which have already been clearly indicated in the chapter on hay fever, such as the regulation of the clothing, a certain amount of outdoor life and exercise, attention to diet, etc.

Asthma is not one of the diseases wherein we can give an absolutely favorable prognosis in all cases. Hence, our therapeutic resources failing, our final resort will consist in advising our patient to seek relief in change of climate. Unfortunately, asthma is, moreover, a somewhat fickle disease, and hence a climate which is favorable in one case will prove unfavorable in another, and we may be at times somewhat at a loss just what advice to give. In general, however,

we may say that those cases of asthma which are associated with hay fever will find the greatest relief by residence at the seashore, while those which are purely neurotic, such as we have termed cases of bronchial asthma, will seek mountainous resorts or high altitudes. Why high altitude should prove beneficial in these cases it is difficult to say; but certainly clinical experience teaches us that the best climate for the purely nervous asthmatic is that of the mountain regions. Thus we find that asthmatics do well in the White Mountains, the Adirondacks, Catskills, or in any elevated region, although complete relief is obtained, probably, only at an elevation of between 3,000 and 4,000 feet. This we find in Colorado, which affords a climate better adapted for the larger number of cases than any other region, probably, in this country. It should be said further, in regard to the effect of climate, that, whereas relief is obtained immediately upon our patients resorting to these regions, and that it continues so long as they remain there, yet the disease is not cured, for they become, as a rule, again subject to their asthmatic attacks as soon as they return to the lower level.

CHAPTER XVI.

NASAL HYDRORRHŒA.

This is a term which we use to designate a curious form of disease affecting the nasal passages which is occasionally met with. The prominent symptom consists of a profuse watery discharge from the nose, which, while presenting many of the symptoms of an ordinary attack of hay fever, occurs at all seasons of the year. There is, however, a certain element of periodicity about it, in that, while occurring every day, in many instances it comes on only at certain definite times each day, though in other instances it seems to persist during the whole twenty-four hours.

The disease is an exceedingly rare one, and we find but few instances recorded in medical literature.

The following cases have come under the author's observation:

Case I.—Dr. H——, aged 58, came under my observation in June, 1882, with the following history: Two months previously he caught what appeared to be an ordinary cold, characterized by nasal stenosis, sneezing, and watery discharge, but these had continued ever since, apparently in a periodical manner as follows: He wakens every morning quite free from every symptom, but usually about 9 o'clock there comes on a feeling of formication about the bridge of the nose, followed by intense sneezing and profuse discharge. It always comes on very suddenly, and persists for from three to six hours, although during the remainder of the day he is not entirely free from his symptoms. Occasionally, although rarely, the attack intermits a single day. The discharge seems to be of an absolutely pure watery character, and in the course of a daily seizure amounts to several ounces. Examination showed it to contain a small amount of chloride of sodium, with traces of phosphates and lime. This gentleman was seen occasionally, for a period of several years, during which time he was subjected to various plans of internal and local treatment, until the fall of 1884, when the discovery of cocaine placed in his hands a measure which gave more relief than anything which had previously been used, and to this day he has continued the use of this drug, securing such relief as it affords, now a period of five years.

When I first examined this patient, two months after the onset of his disease, I found no notable evidence of any chronic lesion of the nasal cavities, although subsequently he developed ordinary mucous polypi in the nasal chambers, which for the time seemed to

aggravate his symptoms, and the removal of which gave a certain amount of relief, although limited.

The development of the polypi was undoubtedly due to the fact that the mucous membrane became sodden and infiltrated with serum in its escape from the turbinated tissues. In other words, it became so far water-soaked, as it were, as to lead to myxomatous degeneration. A certain amount of relief was given by the application of the galvano-cautery to the turbinated tissues; the action of this remedy being due to the fact that the superficial cauterization deposited, as it were, upon the surface of the membrane a superficial and inelastic coat, which temporarily gave support to the blood-vessels and for a time arrested the serous exosmosis. A full trial of a continuous current in this case was made without relief, although a stronger current than that afforded by seven cells was not tolerated by the patient, on account of the severe pain.

Case II.—Observed by the author. Dr. D——, aged 40, consulted me on April 7th, 1882, with the following history: For twelve months he had suffered from a profuse watery discharge from the nose, which had been a source of such distress to him as almost to incapacitate him for business. The discharge was not persistent through the day, but came on usually twice, viz., in the morning at 8, lasting about one hour, and again in the evening, from 5 to 6. The appearance of the discharge was preceded by a sense of intense formication about the bridge of the nose, followed soon by the dropping. The amount during the hour usually was about one ounce. On damp days, however, the discharge was persistent throughout the whole day, when its amount was usually a pint. With few exceptions, the discharge ceased during the night. Dry hot weather seemed to give relief. There was a history of intermittent fever twenty years before, and again eight years before. Up to twelve months before consulting me, he had been a sufferer from facial neuralgia. This, however, ceased with the setting-in of the discharge. An examination showed his nasal cavities to be in a state of perfect health. The discharge was a clear white watery fluid, of a salty taste and feebly alkaline, and contained a small amount of chloride of sodium, as shown by chemical test. I advised the use of quinine, which he took to the extent of ten grains each night, for three weeks, with the result of absolutely arresting the trouble. A week after, however, he ceased the use of the drug, and the discharge commenced again. He resumed his quinine, now without the slightest effect. During the following summer, he had an additional daily attack of an hour's duration, from 12 to 1 o'clock. At this time he tried the effect of various remedies. Atropia seemed to aggravate the difficulty. Townsend's remedy was absolutely of no avail; tincture of elfrasia (a homœopathic remedy for hay fever) seemed to give notable relief for a time, in doses of eight minims every four hours. Ergot, in combination with digitalis, also was used without avail. In the fall he commenced to suffer at night for the first time, and, as the cooler weather set in, he resumed the use of quinine with a certain amount of relief, although the continuance of his attack seemed now to have a notable effect on his nervous system, and he commenced to suffer from extreme

mental depression. Occasional doses of quinine now seemed to relieve him during the fall months, and on through the winter. The subsequent history of this case consisted in a certain amount of relief from the occasional use of quinine, and the trial of various other remedies without effect, until on February 1st, 1884, he commenced the use of the galvanic current from a battery of ten cells, with very marked relief, an electrode being applied on either nasal bone. This was continued until July 20th, with the result apparently of curing him entirely. At this time he went to the mountains, and while in Saratoga he had an attack of a very severe character, lasting the whole day. He immediately returned home, and resorted to the use of electricity without avail, and in despair concluded to abandon all treatment, when at the end of a few days the discharge ceased as suddenly as it had come on, since which time he has enjoyed entire immunity from the affection. Lichtwitz reports a case in which the flow had existed intermittently for twenty-nine years. It was cured by puncture of the right frontal sinus. Lichtwitz agrees with the author as to the cause of the disease.

It is interesting to note, in connection with this case also, that after the disease had persisted for something over a year mucous polypi developed in the nasal cavities, which had heretofore been entirely healthy, due solely, as suggested in the previous case, I think, to the profuse escape of watery fluid into the mucous membrane. The presence of these growths did not seem to notably increase the discharge, nor did their removal seem to ameliorate the symptoms. It should be stated that this patient, in addition to the use of electricity, subjected himself to a systematic course of Turkish baths followed by the cold sponge, together with vigorous massage three times each week, during a considerable period of time, in connection with the electrical treatment.

In addition to the above two cases, which came under my own observation, I have in my notebook five others, the details of which, however, are somewhat meagre and are scarcely worthy of record, other than as illustrating the fact that this disease is by no means so rare as one would suppose, when we consider the small number of cases that have been reported in current medical literature. Of these five additional cases, one was a maiden lady, aged forty, engaged in literary life, and of a decidedly neurotic temperament, whom I saw but once. The second was a young lady of twenty-eight, in the enjoyment otherwise of fairly good health, in whom no treatment was of any avail, although under occasional observation during a period of two years. The third was a physician of about forty, whom I saw but once, and who suffered from hay fever during four months, while during the rest of the year he suffered from almost daily attacks of watery discharge from the nose, which was aggravated by intense cold, wind, dust, etc. The fourth was a gentleman aged fifty-one, who had suffered for a year with daily attacks, coming on early in

the morning, from one to four o'clock, and lasting several hours, during which time there was discharged about half a pint of clear watery fluid. This patient I saw but a single time. The fifth was a maiden lady, aged thirty-five, whom I have seen but twice, and who consulted me in regard to a watery discharge from the nose, attended with violent irritation and sneezing, and which came on daily, lasting two or three hours at a time.

Etiology.—After a careful examination of the cases it would seem no easy matter to give an explanation of the phenomena which they manifest, other than purely speculative, and yet I think there is much that is exceedingly instructive. The first feature which strikes us perhaps is the fact, that in a certain class of cases, the escape of watery fluid is merely passive and painless, while in the other the flow of water gives rise to symptoms of intense irritation, such as we observe in ordinary cases of hay fever. This one symptom will serve to divide these cases, then, into two classes. In the first of these the essential lesion consists of an ablation of function of the trifacial nerve, which, as we know, exercises an inhibitory action upon the serous exosmosis which takes place normally in the nasal mucous membrane. In connection with the paralysis of this nerve, of course, there occurs paralysis of sensation, and henceforth the transudation of fluid takes place without consciousness on the part of the sufferer. This feature was particularly noticeable in a case of Althaus', in which the pathological lesion seems to have been thoroughly recognized, and the diagnosis established, of neuritis involving the fifth nerve of both sides. The question arises whether the disease is due to a neuritis, as in this case, or to some other lesion affecting either the nerve trunk or the central ganglia, as in two cases of Priestly Smith's. In a case of Paget's, an autopsy revealing the existence of polypi in the antrum of the side affected, these were accepted without question as the cause of the watery discharge. A more rational view, it seems to me, is that the polypi were the result of the affection, and that the essential lesion consisted of some obscure condition at the base of the brain, which gave rise subsequently to an attack of acute meningitis, to which the patient succumbed. Certainly it is difficult to understand how the existence of polypi in an antrum should cause the symptoms, while, on the other hand, it is very easy to see how a vasomotor paresis with profuse watery discharge should give rise to mxyomatous degeneration, whether in the antrum or in the nasal cavity, in the same manner as occurred in two of my own cases. In another class of the cases, we see that the watery discharge gives rise to an intense irritation of the nasal mucous membrane, as manifested by the peculiar formication and sneezing, which becomes a source of

exceeding great distress. This, of course, can only occur in cases in which the general and special sensibility of the Schneiderian membrane is intact, or in other words, in cases in which the integrity of the trifacial nerve is preserved. We must, therefore, seek for a cause of the hydrorrhœa in these cases, in some lesion other than of the trifacial. We content ourselves with the statement that this lesion consists of some disturbance or irritation involving the sympathetic system of nerves. Whether it is peripheral or central, can only be a matter of speculation. It is a noticeable fact, in these cases, that there is no evidence of cerebral disturbance whatever, other than an occasional headache, which is relieved by the setting-in of the watery discharge. The headache is easily explained, in that it is probably an ordinary plethoric headache, which is relieved by the local exosmosis, in much the same manner as we frequently see headaches relieved by the relief of nasal hyperæmia. This latter class of cases, therefore, is very closely analogous to ordinary cases of hay fever. Moreover, we see in them a certain diurnal periodicity, which would seem to indicate that the causes which act to produce the symptoms are operative only under certain atmospheric conditions. In a number of these cases, the membrane seemed to be exceedingly sensitive to the action of cold, wind, dust, or other irritants, thus manifesting a condition which is almost always present in hay fever, in that a large majority of patients who suffer from autumnal attacks of this disease are peculiarly sensitive, at all seasons of the year, to the action of smoke, dust, or irritating vapors. Sex would seem to have but little influence on the affection. It belongs essentially to adult life. Traumatism, as a possible remote cause, is mentioned in several of the histories, although a careful reading of the cases fails to establish any clinical connection between the injury and the hydrorrhœa. The neurotic element seems to have been present in many of the cases quoted by writers on the subject, in much the same way as we find it in hay fever, which brings us to the question as to what relation the one disease bears to the other. Certainly, as regards the cases dependent on lesion of the trifacial, I doubt if there is any connection, but in those in which the trifacial was not involved, and which we refer to some obscure lesion of the sympathetic, I think there can be no doubt that the disease is very closely allied to hay fever, in that it is dependent, to a large extent, on what we call the neurotic habit. The other two essential causes of hay fever, viz., a diseased condition of the nasal mucous membrane, together with the impact upon it of the pollen of flowering plants, are not present. In my own cases, no lesion was found in the nasal cavities. We can only say, then, of these cases, that in connection with an intensely

neurotic temperament the nasal mucous membrane is rendered sensitive to some obscure atmospheric condition, under the action of which vasomotor control of the blood-vessels, whose special function is the exosmosis of serum in the normal process of respiration, becomes paralyzed, and that this exosmosis takes place to an abnormally large extent. Under the term neurosis, of course, in our ignorance of essential pathological lesions, we must include some probable organic lesion of the nerve trunk or of the ganglionic centres of the sympathetic system. That there is an atmospheric condition which excites the attacks in some instances I think we must accept on clinical grounds, in that they occur daily, at about the same time, and in each individual case persist for the same period. This view is, furthermore, strengthened by the fact that dampness, heat, and other atmospheric conditions have a marked influence in aggravating or alleviating the severity of the symptoms.

Symptomatology.—The symptoms of the affection consist essentially in a dropping of clear, transparent, watery fluid from the nose, which may come on either gradually or abruptly, and while it lasts, consists of a constant flow of water from the nostril, which may be attended by a violent sense of irritation or not, according as the disease is dependent upon a morbid condition in the sympathetic control of the blood-vessels of the nasal mucous membrane or of the trifacial. This dripping may continue during the whole twenty-four hours, or it may manifest a certain diurnal periodicity. When it occurs during the night, it is usually somewhat diminished, although in many cases it continues during the sleeping-hours, accumulating in the cavity of the nose and pouring out, as it were, on a change of position. If it passes into the pharynx, it may give rise to cough, or even attacks of spasm of the glottis, or the discharge may be poured out upon the upper lip, producing excoriation and ultimately almost a cicatrical condition of the skin. If the attack is accompanied by sneezing, etc., it may become a source of very great distress and even suffering to the patient. When, however, sensation is abolished in the nasal cavity, the condition is merely one of discomfort and annoyance, so far as the watery discharge itself is concerned.

Prognosis.—In those cases which are essentially neuroses of the sympathetic, and which are so closely allied to hay fever, the prognosis is somewhat unfavorable, in that we have difficulties to contend with greater even than those with which we have to contend in hay fever. Now, this latter disease, as we know, is an exceedingly fickle one, and in many cases will resist every effort to afford relief, although we have here a definite local lesion in the nose as a prominent factor in causation, the removal of which presents a clear

indication for treatment. In the disease in question, however, the only tangible lesion with which we have to deal, is the neurosis, and this in most cases will seriously tax our therapeutic resources. Of seven cases of this variety which were under my own care, but one was cured, although but three of them were under my care for any prolonged period of observation. Moreover, in the one case which was cured, it is somewhat doubtful whether the fortunate termination was the direct result of any therapeutic measures. As regards the cases dependent upon a lesion of the trifacial, no prognosis can be given, unless the special lesion which has caused the disease can be definitely ascertained, in which case the prognosis will be based entirely on this information.

Treatment.—The indications for treatment are twofold: first, the use of such local applications in the nose as control vascular turgescence, and, second, the resort to such therapeutic resources as we possess, for the remedying of the morbid lesion in the nerve trunk. The first indication is better carried out by the resort to cocaine, whose local action in controlling vascular turgescence is prompt and certain, beyond any other drug which we possess. The patient should be provided with a proper atomizer, and, commencing with a four-percent. solution, gradually reduce it, until he finds the weakest solution which will afford him relief, when he is allowed to obtain such comfort as may be afforded by its application as frequently as may be demanded. I think it is very questionable whether internal remedies have proved of much avail. In the second of my own cases, after the use of numberless drugs, the patient was finally cured by the use of the galvanic current, locally applied, a method of treatment which seems in every way rational and apparently clearly indicated, and yet in my first case this resort was not only of no avail in giving relief, but seemed to aggravate the disease. The best, then, that we can say in regard to treatment is that when we can definitely ascertain the cause of the disease the indications for treatment are clear. When the cause of the disease is obscure, as is the case in the large majority of instances, any plan of treatment must be to a large extent experimental, and governed by such indications as may be found to exist upon a careful study of each individual case.

CHAPTER XVII.

ANOSMIA.

Disturbances of the function of olfaction may manifest themselves in an increased activity of this sense, giving rise to what is usually designated as hyperæsthesia.

Our main interest, however, in this connection, lies in the consideration of that form of perversion of olfaction which is characterized by an impairment or total loss of the sense of smell, usually designated as anosmia.

Etiology.—This symptom may arise from any condition which interferes with the entrance of odorous particles upon the mucous membrane of the olfactory tract, or from any morbid condition of the olfactory nerve itself. Under this latter head may be embraced lesions of the terminal filaments or trunk of the nerve or of the bulb. In the former class may be included acute rhinitis, hypertrophic rhinitis, fractures or deformities of the septum, nasal polypi, and other forms of neoplasm. Tumors of the pharynx or palato-pharyngeal adhesions may also give rise to anosmia. Among the causes of the disease which lie in a morbid condition of the nerve itself are atrophy of the bulb or of the trunk of the nerve, or the nerve may be absent.

In addition to these, several congenital cases have been reported. Traumatism also plays an important part in the production of the symptom, or in a separation of the bulb from its branches as they enter the cribriform plate of the ethmoid.

In one case reported permanent anosmia supervened upon a meningitis following a blow upon the occiput.

Tumors of the brain, it would seem, are not liable to give rise to complete anosmia, in that their location as pressing upon both nerves would be somewhat unusual. There can be little doubt that very many cases of cerebral hemorrhage or neoplasm result in a destruction of functional activity in the olfactory nerve on one side, and yet this condition is probably so masked by the more serious symptoms from the central lesion that they escape notice. The main point of interest in this connection is that the condition always occurs

on the left side, and is associated with aphasia and paralysis of the right side of the body.

Those cases in which the affection is the result of a morbid condition of the terminal filaments of the olfactory nerve are probably also to be classed as neurotic. In this category are to be embraced those cases in which permanent anosmia results from the inhalation of irritating or highly offensive gases or powerful odors. Graves reports a case in which a man subjected himself for a period of several hours to the exceedingly offensive and irritating gases emanating from a cesspool. A permanent loss of smell followed. In a case reported by Stricker the same accident happened to an entomologist from working several hours a day in an atmosphere surcharged with ether, which he used in the preparation of his specimens. It is a noticeable fact, in these cases, that the anosmia occurred only after the terminal filaments of the nerve had been subjected to the irritating action of these agents for a prolonged period of time, and its prolonged action must undoubtedly give rise to some definite morbid change.

Symptomatology.—The close relation between the sense of smell and the sense of taste has already been fully discussed in connection with the physiology of olfaction. A loss of the sense of smell is always accompanied by a deterioration of the sense of taste, and it is through this latter deficiency that anosmia really is recognized, in the majority, if not in all instances. There seems to be a connection between the olfactory properties of the upper nasal passages and general sensation, although Magendie entertained the view that olfaction was dependent upon the branches of the fifth pair, a view which Bernard supports by reporting a case in which the disagreeable odors of an outhouse were complained of by a patient, in whom the cribriform plate, together with the olfactory nerves, were found absent on post-mortem examination. This may have been a case of parosmia, similar to that of Bérard's, or more probably, as Althaus suggests, the disagreeable odors were largely made up of ammoniacal effluvia of the fetid hydrogens, which could easily be appreciated by the general sensation of the mucous membrane. From a clinical point of view, however, the two properties are distinct, and in no way interdependent, for the anosmia may be complete while the general sensation is in no degree impaired. In the majority of instances, however, the condition is not one of complete anosmia, but rather a more or less notable impairment of the function. Especially is this true of those cases in which the condition is due to an obstructive lesion in the nose, which prevents the entrance of odorous particles, as in nasal polypi and other tumors, acute rhinitis, hay fever, etc., the

extent of the anosmia bearing a close relation to the patency of the cavity. When, however, the affection is due to a nerve lesion, the anosmia is usually complete, although it is noticeable in this form of the disease that, in many cases, the complete loss of function is preceded by certain disturbances, such as hyperosmia or parosmia. Thus, in a case reported by Lockeman, the primary stage of the affection was marked by the appreciation of disgusting odors, while Althaus has observed a case in which the odor of phosphorus was a source of great annoyance to a patient who subsequently developed complete anosmia.

Prognosis.—The differential diagnosis between essential and symptomatic anosmia is a matter of some importance as regards prognosis, in that, while recovery from the former is exceedingly rare, in the latter, we may usually give a favorable opinion, dependent upon our ability to remove such local obstructive lesion in the nose as rhinoscopic inspection reveals. Perhaps the only cases in which a favorable opinion can be given in essential anosmia are those dependent on syphilis. In a case reported by Raynaud the anosmia seemed to be due to malarial poisoning, in that it was intermittent, recurring every day at five o'clock; moreover it was entirely cured by the administration of quinine. A nice question arises here, as to how long the olfactory nerve will retain its integrity while its function is affected by an obstructive lesion of the nasal cavity. It is an almost universal rule in the economy, applying alike to gland structures, muscles, and probably to nerves, that when their function is ablated they show a tendency at least to degenerative changes of an atrophic character. Hence, if the function of the olfactory nerve is suspended by some lesion of the nose which absolutely prevents the approach of odorous particles, this tendency manifests itself, and if the lesion remains for a sufficient period of time the nerve will have undergone such atrophy as that its integrity cannot be restored by the removal of the obstruction. No definite period can be stated during which the nerve may retain its functional activity, and it must vary in different individuals. It is not to be understood that the prognosis is unfavorable in cases of anosmia due either to peripheral or to brain lesions.

Pathology.—It is impossible to describe any pathological lesion as belonging essentially to anosmia, in that the disease is a symptom of a variety of diseases rather than a disease itself. Thus, it may be dependent upon a tumor of the brain, pressing upon or involving the olfactory centre in or near Broca's convolution; or involving or perhaps pressing upon the nerves in their continuity; or upon the bulbs themselves. The only special interest which attaches to this

branch of the subject, however, is in connection with the changes which may occur in the olfactory region. I know of no observations bearing on this subject, and yet it seems clear that, in many cases, we must concede that the diseased condition of the brain itself is responsible for the loss of the sense of smell. Aside from those conditions in which the approach of odorous particles to the terminal filaments of the olfactory nerve is prevented, this condition probably consists of some atrophic change occurring in the terminal filaments of the nerve, due either to the pressure of local inflammatory deposits or to deficiency of circulation. Or, again, it may be connected with the degenerative changes which occur in old age, as has been found by Prévost. In more frequent instances, however, we must look for local inflammatory changes as the source of the condition. Thus, in an ordinary acute rhinitis we may have anosmia persisting for many days after the inflammatory process undergoes resolution; while in hay fever, in which the local inflammatory action persists for a still longer period of time, there may result an anosmia of even months' duration. The same thing also occurs in croupous and diphtheritic rhinitis, especially in the latter, in which the symptom is the result of local changes rather than of blood poisoning.

Diagnosis.—The essential importance of the diagnosis consists in the determination as to whether the symptom be due to a local condition of the nasal chambers or to a diseased condition of the nerve; in other words, whether we have to deal with an essential or symptomatic anosmia. This can only be determined by a careful examination of the nasal cavity, and by the elimination of any possible local cause there. This, taken in connection with the history of the case and the concomitant symptoms, ordinarily will suffice to establish, with a considerable degree of certainty, the existence or non-existence of any central disease.

The simple test for olfaction consists in the use of odorous substances. In the selection of these, however, one should always make use of a substance which is recognized purely by its odorous qualities, the most delicate test, of course, being the fragrant odors, whereas the disagreeable odors are often deceptive, in that what is unpleasant often is not necessarily a genuine odor. If it is desired to accurately and determinately ascertain the condition of the olfactory nerve, it will be necessary to resort to the use of the galvanic current, Althaus having shown that this nerve, when healthy, affords a direct response to the electrical stimulus. A current from a thirty-five-cell battery, being passed as nearly as possible through the course of the nerve, gives rise, according to the integrity of the nerve, to a well-marked subjective odor of phosphorus. Unfortunately, the application of this test

may be exceedingly limited, in that, except in rare instances, in which there is paralysis of the fifth pair of nerves, a current of this strength will be too painful for endurance. The existence of a unilateral essential anosmia, although not easily recognized, can be determined by delicate tests, and ordinarily should be regarded as evidence of brain lesion. A determination of the loss of smell, on one side alone, would require, of course, a very careful and complete closure of the opposite cavity, both before and behind.

Treatment.—Clinical observation has failed, as yet, to afford us any very notable suggestions for the successful treatment of an essential anosmia. Our interest in this connection mainly centres on those cases in which this function is to a greater or less degree enfeebled, as the result of some obstructive lesion in the nasal cavity. In the larger number of instances the indications for treatment are nothing further than the removal of the organic lesion in the nose. In certain instances, however, in which after this has been successfully accomplished the sense of smell is found still notably impaired, it becomes necessary to resort to measures for its restoration. For this purpose we may use in a routine way, perhaps, preparations of strychnine, arsenic, phosphorus, or any of the ordinary remedies which are supposed to possess specific properties in restoring tone to the nerves. I confess that I have never seen any directly recognizable good results from the administration of any of these drugs. It should be borne in mind that the alkaloids are absorbed by the nose with more readiness even than by the stomach, and that the full physiological effect of the drug is thus obtained almost as rapidly as by means of a hypodermatic injection.

Our most reliable measure, however, will be the use of the galvanic current, commencing with daily applications of a weak current, and increasing the strength according to tolerance. In some cases, faradization will give even better results than the continued current. I think in many cases, in which the nerve has become enfeebled by long-continued disuse, we may stimulate it into functional activity by forcing it, as it were, to fulfil its normal duties. This can be accomplished by using not irritating but agreeable odors, of as powerful a kind as are easily obtainable, and frequently changing them. The choice of odors will be such as the patients' fancy may dictate, but these should be frequently changed, a half-dozen different ones being used in the course of the same day, and applied frequently, first to one nostril and then to the other. In this way, we may obtain even better results than by the use of electricity, or the internal administration of strychnine or the other nervines.

CHAPTER XVIII.

DEFORMITIES OF THE NASAL SEPTUM.

Deformities of the nasal septum, as a result of either traumatism or inflammatory action, are probably the most frequent of all the exciting causes of catarrhal inflammation in the nasal mucous membrane. And it is of great importance that we should thoroughly appreciate, not only how they develop, but also their action upon the lining membrane of the nasal cavities, as well as their influence upon its respiratory functions.

In health, we find the nasal septum presenting simply as a bony and cartilaginous wall, dividing the nasal passages into two symmetrical cavities. It thus possesses no very important function in the economy. In diseased conditions, it presents certain abnormalities of contour, which undoubtedly have a marked influence in the production of ordinary catarrhal inflammation. The first to recognize a deformity of this structure was Quelmalz, who described septal deflections, attributing their existence to the habit of putting the finger into the cavity.

Morgagni, making a more special investigation of these parts, attributed the deflections to excessive growth of the septum, by which it became too large to fit in its bony framework and was thus warped.

Zuckerkandl, who has made perhaps the most thorough study of this subject, bases his statistics largely, I take it, on an examination of the cadaver, which I think unquestionably affords us more accurate data. In 370 crania, he found 123 symmetrical and 140 asymmetrical nasal septa. Among the latter, the septum deviated to the right in 57 cases, to the left in 51, and was sigmoid in 32.

A study of the living subject gives us still further information, Heymann going so far as to state that 90 per cent. of all cases examined will show deformities. This would seem rather an extravagant statement. If we recognize only those deformities which give rise to morbid symptoms, certainly this percentage should be very much reduced.

A notable difference as regards race is observed by Zuckerkandl,

in that 103 of his cases were barbarous or semi-barbarous people and in these only 24 were asymmetrical. This observation was confirmed by Mackenzie, who, in 430 examples of symmetrical septa, found only 22.6 per cent. in the superior races. Harrison Allen also found, in 93 skulls of negroes, deformity of the septum in only 21.5 per cent.

Classification.—Various classifications have been made, but their practical value is not very obvious. In a general way we find the nasal septum, as the result of a fracture, presenting certain typical appearances which are easily recognized. Thus, we may have the cartilage of the septum broken in the vertical line in such a way that the projecting ridge presents in one passage, with a corresponding depression in the opposite side. More rarely we have the cartilaginous septum broken in a line more or less nearly approaching the horizontal. These fractures occasionally involve the vomer in such a way that the horizontal ridge extends through both the cartilaginous and bony portions of the septum. In another class of cases, the injury results in a dislocation of the articulation between the vomer and the superior maxillary bone in such a way that the lower border of the septum is shifted, as it were, to one side, thus encroaching on the lumen of the nares. A deflection involving the posterior extremity of the vomer I have never seen. Schaus, however, has found the deflection extending to the posterior nares, producing asymmetry in these openings. He bases his observation on digital examination rather than on rhinoscopy. It is characteristic of all these deviations that, in every case, an angular or a rounded projection of the septum into one nostril is attended with a corresponding depression on the opposite side.

In addition to this, we find a large number of cases, in which there is present a more or less prominent deformity on one side of the septum, which is not accompanied by this corresponding depression. This condition is always found along the sutural lines of the septum, and consists in a more or less well-developed angular prominence or ridge, which, projecting into the nasal passage, acts to obstruct normal respiration. In most instances, these ridges are confined to one side of the septum. In other cases, we find them occurring symmetrically on either side of the suture, thus constituting a condition not properly classified under deviation or deflection of the septum. These were first described by Langenbeck, who gave to them, mistakenly I think, the name exostoses, a term which is frequently used even at the present day. Subsequently they were recognized and described by Theile, Harrison Allen, John Mackenzie, Zuckerkandl, and others.

Etiology.—The causation of these deformities has been the subject of no little discussion, and various theories have been advanced to account for their occurrence. As regards those deviations which are due to fracture of the septum, of course there can be no question; they are due to a direct blow upon the nose. When we come, however, to discuss the causes of the sigmoid flexure, or unilateral bulging of the septum, as also the sutural ridges, a pretty large field for discussion is opened up. That the septum may be crowded up by a highly arched palate is an idea worth consideration and was suggested by Trendelenburg, who first called attention to the frequent association of these two conditions. Jarvis has reported four cases in which this association occurred, all in the same family, which would seem to suggest that there might be an hereditary or systemic habit pre-existing, to account for the bony deformity. According to Schaus and Welcker, certain abnormal conditions of facial development dependent upon rachitis or mollities ostium are frequently associated with deformities of the septum. But these, after all, form but a very small proportion of cases which we observe and I think a larger clinical observation would lean to the view that traumatism is by far the most frequent direct cause of septal deformities. The clinical history of many of these cases affords direct evidence of this, and even in those cases in which the injury is not testified to I think it safe to say that an injury has occurred, which may have been of so slight a character as not to have excited especial attention at the time of the occurrence. An injury to the nose in childhood or infancy need not necessarily give rise to the immediate development of a notable deformity, as in fracture, but it may set up a low grade of morbid action, which, going on through a number of years, will finally develop a condition by which the normal function of the nose is seriously hampered. The point which I would particularly emphasize in this connection is that, in the first place, the lesion results in a slow process of development, and, secondly, that the catarrhal symptoms which ensue develop only after another long lapse of time. Zuckerkandl has shown us that deformities of the septum never occur under seven years of age, while Welcker saw none before the fourth year. This, however, does not controvert the views that I advance, for, as I say, the injury may occur before either of these ages, without resulting in any notable deformity for many years later. Of course, these observations do not refer to fracture of the septum, which undoubtedly may occur at a very early age. Furthermore, these deformities, as the result of traumatism, although rarely, still do occur very early in life, for my own recorded cases show one operated upon at three years of age and another at five.

That the injury may occur without the clinical history of traumatism is very early shown by Robertson who, in an examination of two hundred and forty cases, found abnormalities of the nose in two hundred and seventeen, while there was a clinical history of injury in but eighty-three cases.

That traumatism plays an important part in the causation of these deformities is the view adopted by Zuckerkandl, who, however, does not explain further the special method of their development. Miot, however, basing his conclusions on a microscopical examination made by Duret, finds that these prominences consist essentially of plastic infiltration, thus establishing the fact that they are inflammatory in their origin, constituting true perichondritis. Bresgen, Volkmann, Onodi, Gottstein, Hopmann, Heymann, and others content themselves with simply assigning a traumatic origin to most cases, which would seem to indicate that the deviation occurred at the time of the injury. The point on which I would lay special emphasis is that the deformity is primarily the result of traumatism, and secondarily of a slow inflammatory process which results therefrom. This view is still further strengthened by the investigations of Zuckerkandl, who has shown that, in many cases, there lies between the perpendicular plate of the ethmoid and the superior border of the vomer a narrow strip of cartilage, apparently due to incomplete ossification of the temporary cartilages. Those spurs or ridges which run along the lower border of the vomer, at its junction with the superior maxillary, probably, in many cases, occur at the time of the original injury, although here we must undoubtedly recognize the fact that a chronic inflammatory process contributes much to their subsequent development into more prominent deformities.

How far syphilis is involved in the causation of these deformities is rather a nice question. My own impression is that all syphilitic lesions in the nasal fossæ run a somewhat rapid course, and develop very soon into ulceration with necrosis, although Trélat asserts that many cases are of syphilitic origin. Rickets has been supposed by some, notably by Loewy, to be the cause of septal deformities. No doubt deformities of the septum are frequently associated with rickets in the same manner that facial deformity is so associated. There is, however, no good reason for supposing this to be an exciting cause. With reference to the curious facial deformities noticed by Schaus and Welcker, in connection with deformities of the septum, it might be stated that Ziem has shown by a series of experiments that occlusion of one nostril in young animals will produce similar facial deformities. It is a question, therefore, whether deviations of the septum may not play a certain part in the causation of fa-

cial deformity, instead of being only a concomitant condition or a result.

Most writers mention the fact that septal deformities may be congenital. This is undoubtedly true, as the child in utero, as well as in the process of delivery, is not exempt from traumatism of a sufficiently violent character to do no little damage to the delicate tissues which form the nasal septum.

Symptomatology.—Objectively, nasal deformities may occasionally be recognized by a deformity of the external nose; this may show itself in what Welcker calls a scoliotic nose, in which the nasal bones are displaced in one direction, the tip being turned to the opposite side. In another form the whole nose is deflected bodily to one side. It is worthy of note that deformities of the external nose are of far more frequent occurrence than is generally supposed; in any number of persons examined with a plumb line, the tip of the nasal organ deviates as a rule from the median line of the face.

Subjectively, the primary symptom to which these deformities give rise is simple nasal stenosis, with interference with normal nasal respiration. Secondarily, however, a series of changes is set up in the nasal mucous membrane, which eventually produce a chronic nasal catarrh. As already stated, I regard septal deformities as responsible, in the large majority of cases, for the whole train of symptoms, direct and indirect, which are embraced under the very general term of chronic nasal catarrh, or, to give it a more specific name, chronic hypertrophic rhinitis. The methods by which this develops have been thoroughly discussed in the chapter on hypertrophic rhinitis. If the deformity completely occludes one nostril, the function of the membrane in that passage is naturally abolished, and the membrane itself collapses, and is seen to be in an almost bloodless condition. Now, as we have shown, it is necessary for the development of hypertrophic changes that air should pass through the fossa. We therefore find it an invariable rule that the greatest extent of hypertrophy develops on that side which is most open. In other words, the combined calibre of the two nasal passages, in which deformity of the septum exists, is unequal to the purpose of the normal respiratory function. We thus find, in those deflections characterized by prominence on one side and concavity on the other, that the turbinated tissue on the concave side not infrequently grows into enormously enlarged masses, which fit into the concavity of the septum. Baumgarten and Seiler declare that these deflections are produced by the hypertrophy of the turbinated tissues. I am disposed to think that these writers have mistaken cause for effect; for, if this were true, in those cases in which we have notable hypertrophy of

both turbinated bodies to the extent of contact with the septum, as suggested by Loewy, we should naturally expect to find atrophy of the septum, or, as Bresgen suggests, even perforation.

Deformity of the septum, probably more than any other single cause, gives rise to attacks of epistaxis, due to the fact that the irregularities of the surface of the septum present certain prominences which are exposed to the ingoing current of air, laden with particles of dust and other impurities, whose action is something in the nature of the sand blast. The walls of the capillaries are denuded or injured, and become the source of more or less violent attacks of hemorrhage without apparent cause.

A very notable symptom in nasal stenosis, and one which I regard as almost pathognomonic of deflection of the septum, is alternating stenosis of the passages.

The voice is affected by a deformity of the septum, its timbre is impaired by the closure of the resonance chambers, and later the catarrhal condition of the larynx and trachea which develops results in hoarseness and loss of voice.

When the deflection in the region of the middle turbinated bone produces a narrowing of the middle meatus, the rarefaction of the inspired air acts more forcibly on the middle turbinated tissues, and we have developed conditions which present certain characteristics resembling the nasal neuroses, by which sneezing with watery discharges becomes a prominent feature of the trouble, the reason being that there is under these circumstances a nerve supply enriched by the distribution of the terminal filaments of the olfactory nerve, and thus a hyperæmic condition of the membrane renders it more delicately sensitive. It is in these cases, moreover, that we not infrequently meet with hay fever, asthma, and the other reflex neuroses, complicating intranasal disease.

The various ear troubles already discussed as dependent upon hypertrophic rhinitis may equally well arise from septal deformities, but in the latter we not infrequently find ear symptoms developing, even before the catarrhal inflammation has progressed to any serious extent. This point I regard as one of no small importance, for, in a number of cases which have come under my own observation, I have seen marked impairment of hearing completely relieved by the removal of a septal obstruction in the nasal passages. This would seem also to substantiate the opinion already expressed, that catarrhal disease of the middle ear is not necessarily due to an extension of the inflammatory action.

Diagnosis.—Recognition of these deformities is based entirely on examination anteriorly, posterior rhinoscopy giving us absolutely no

information. I fully concur with Mackenzie that these deformities never extend to the posterior nares. An examination should be made with a good light, cocaine having first been applied to effectually contract the mucous membrane and open up the passage for thorough inspection. Care should be taken in making this examination to tilt the tip of the nose thoroughly to one side, so as to bring the plane of the normal septum into as nearly a direct right line with the observer as possible. Seiler has devised a septometer for measuring the thickness of the septum at various points, which may be of service, although much the same end may be accomplished by placing a speculum in each nostril, and, while throwing the strongest light into one, observing the translucency of the tissue through the other. The shadows thus formed, and the opacities or semi-opacities thus displayed, often afford information which may be of value. The probe affords us a means of testing the character of the prominences which may exist, whether they are bony or cartilaginous or glandular, the vascular prominences being eliminated by the use of cocaine.

Zuckerkandl has described a somewhat rounded mass of glands, first alluded to by Morgagni, which is found in a normal condition in a line about opposite the middle turbinated bone, especially at its anterior extremity and about the lower margin of the olfactory region. Creswell Baber describes this prominence as the tuberculum septi. It consists essentially of a mass of muciparous glands, soft to the touch, which need not lead to error in diagnosis. It would seem that the diagnosis of deformity of the septum would present few difficulties, and yet I have frequently had sent me patients with the diagnosis of nasal polypus, in whom the red mass or face of the projecting portion of the deflected septum occluding the nostril gave rise to this error. It need only be borne in mind that a polypus or fibroma is more or less freely movable on the impact of the probe, and soft to the touch, while the deflected septum is rigid and immovable. The same may be said of abscess or angioma of the septum.

Prognosis.—Those cases which have not led to the development of complicating disorders, such as catarrhal inflammation of the upper air passages, ear disease, etc., of course, demand only a restoration of the normal respiratory freedom for entire relief to symptoms. In other cases in which, as the result of multiple fracture, the septum is crumbled, as it were, into a shapeless affair, complete restoration cannot be promised. When ear disease has set in, without the interposition of a catarrhal rhinitis, the results of treatment are as a rule most gratifying. When the symptoms developed are merely those of catarrhal inflammation of the upper air passages, the successful operation on the nasal septum goes far toward giving relief to the ca-

tarrhal symptoms, and yet, as a rule, more or less subsequent treatment will be demanded for the relief of the condition. In hay fever and asthma the course is so far complicated by other elements as to render our prognosis exceedingly uncertain, and yet when these neuroses exist in connection with a deformity of the septum it is extremely doubtful if any relief can be afforded until the operation has been successfully done, and perhaps no single measure in these diseases gives more satisfactory results.

Treatment.—The essential feature of these deformities which demands correction is the stenosis, as from this arise all the sequelæ and complications which accompany them. When the deformity has occurred as the result of a fracture, this may be attempted, either by removing the projecting portion of the deviation or by restoring the fragments to their normal plane. Ingals would restore the septum in this way: After dissecting up the mucous membrane, he excises a V-shaped piece from the deflected cartilage, and subsequently brings the parts together by sutures, thus recognizing the redundancy of tissue which is usually present in these cases, while Heymann removes the projecting portion by means of an ordinary carpenter's chisel, a method also adopted by Seiler. Demarquay still further complicates the operation by opening the cavity by an incision along the ridge of the nose, in the median line, for the purpose of gaining free access to the parts, after which he dissects the mucous membrane from the prominences, which he removes with a knife, and then unites the membrane over the part by sutures, subsequently closing his external wound in the same manner. A somewhat similar operation was done by A. C. Post, of New York, as quoted by Robinson. He opened the nose externally by Dieffenbach's operation, by an incision along the alar fissure, while Richet, as quoted by Miot, opens the nasal cavity by separating the columna from the lip and also from the lower border of the septum, which is thus thoroughly exposed, enabling him to remove the projection. It need scarcely be added that an operation which involves incision of the facial integument is rarely, if ever, justified for the relief of these deformities. Linhart, going further, deems it necessary to dissect up the mucous membrane on both sides of a deflected cartilage before removing the projecting portion.

An instrument which was based on a thorough recognition of clinical indications was the punch devised by Blandin, shown in Fig. 33, which consisted simply of a modification of the ordinary shoe-punch, by the use of which he was enabled to remove one or more small discs of the projecting portions of cartilage. Blandin's idea was simply to ablate the projecting portion of the deflected septum,

recognizing the fact that the perforation did not necessarily constitute a morbid lesion.

The punch is easy of manipulation, and in many cases in which the deflection represents an angular prominence accomplishes the pur-

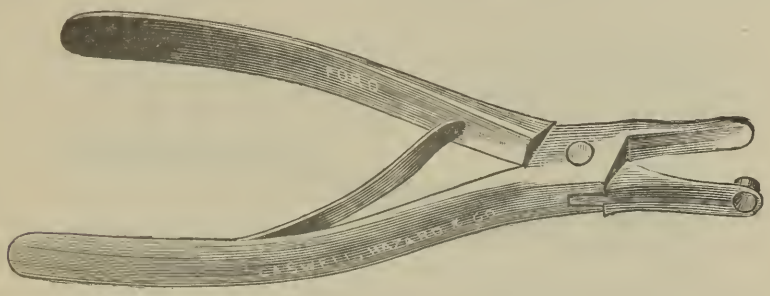

Fig. 33.—Blandin's Septal Punch.

pose of removing the stenosis in a fairly satisfactory manner. Steele has devised a punch (see Fig. 34) in which the cutting blades radiate from a centre, and when brought together produce a series of triangular flaps, which will allow of the deflected portion being brought down to the normal plane. John Mackenzie gives priority in this device to Dr. James Bolton, of Richmond, who published a case of deflected septum, which he operated upon by producing these stellate incisions by means of an instrument resembling a buttonhole-scissors, a better instrument, it seems to me, than Steele's punch; as re-

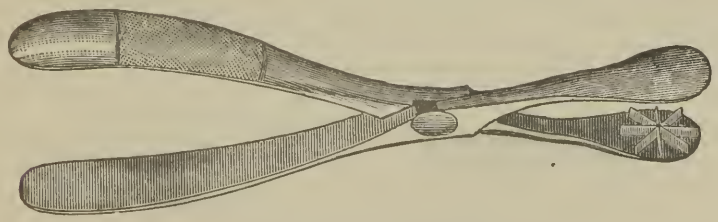

Fig. 34.—Steele's Septal Punch.

gards priority, the principle was first suggested by Chassaignac, who made use of the bistoury, which to me seems a more rational method than either the punch or the scissors, in that its movements can be directed in a far more intelligent manner. The operation which came most largely into vogue after its publication was that of Adams, who advised that the septum should be seized with a forceps, shown in Fig. 35, and crushed, as it were, or refractured, in such a manner that it could be restored to its normal plane, after which a clamp (see Fig. 36) was to be worn for a period of three days, followed by the

use of a pair of ivory plugs (Fig. 37), which were to be worn during the day and removed at night, until firm union had taken place.

Jurasz has modified this instrument by combining forceps and clamps in a single instrument in such a manner that, after crushing the septum, the handles are removed, leaving the clamps in position to hold the fragments in a straight line.

When there is considerable distortion of the external nose, due to a bending of its cartilaginous portion, I think Adams' operation is

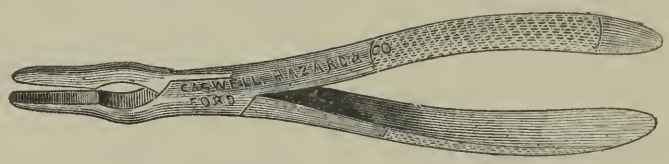

Fig. 35.—Adams' Forceps for Refracturing a Deflected Septum.

often indicated as serving to remedy the facial deformity, although I think it is not usually successful in removing the stenosis, for it must be remembered that, when we have fracture of the septum, there is invariably a considerable degree of thickening at the point of the original fracture, which renders refracturing in this line almost impossible. Moreover, the operation is an exceedingly painful one, and the subsequent treatment in wearing clamps and plugs subjects the patient to a period of great discomfort and even suffering. When the facial deformity involves a deflection or distortion of the

Fig. 36.—Adams' Nasal Clamp.

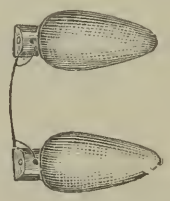

Fig. 37.—Adams' Nasal Plugs.

nasal bones Adams' operation is inadequate. I think the prominent indication, both in deflections and deformities, is the removal of the projecting portion and the restoration of the septum to a plane approaching the normal as nearly as possible. In most of these cases, however, we encounter bone as well as cartilage; a knife is utterly inadequate to thoroughly remove the obstruction. The scissors, also, I think, fail in most cases for the same reason. Furthermore, I deem it of the greatest importance, in removing these obstructions, that a thoroughly smooth surface should be left, for when a jagged, uneven surface remains the result is unsatisfactory, and the period

of healing occupies an unnecessarily long time. The use of various forms of burrs, such as are shown in Fig. 38, operated by an ordinary dental engine, or the electro-motor, is advocated by Seiler and others, while Holbrook Curtis has devised a series of small trephines

FIG. 38.—Various Forms of Burrs for the Removal of Septal Deformities.

FIG. 39.—Curtis' Nasal Trephines.

(shown in Fig. 39), which work by an electro-motor, whose use he advocates for the removal of deformities of the septum. The objection, I think, lies against these devices that they fail to leave a smooth, unbroken surface, which is a matter of no small importance.

For those cases which present a horizontal ridge projecting into the cavity from the lower portion of the septum, the saw would naturally suggest itself as an efficient instrument, as giving a clean-cut surface and going readily through both bone and cartilage. Some years since, Woakes made use of this device, recognizing its value, and subsequently Seiler recommended the use of a metacarpal saw for removing the bony projections or "exostoses."

The essential features of such a saw are a thin blade and fine teeth, that it shall take hold readily of the tissue.

The instruments above noted failing in my hands, I resorted to various devices for securing a proper model, till finally I had one constructed as follows: the blade as thin as possible, consistent with strength, one-eighth of an inch wide, five inches long, with a cutting edge of three inches, with thirty teeth to the inch, each tooth an exact equilateral triangle, with no cross-cut and no set to the teeth, the handle being three inches long, of sufficient size to be easily grasped by the hand, and attached to the blade at an angle of forty-five degrees, in order that the hand should in no way obstruct the view

while operating. These saws were constructed in two forms, one with the cutting edge upward and the other with the cutting edge downward. This instrument (shown in Fig. 40) simply removes the presenting portion of deformities and deflections of the septum, the end in view being to cut as nearly as possible in the plane of the normal septum. In other words, to saw out a new septum, as it were, as one would saw a board from a log, removing those deformities which may be found in either fossa.

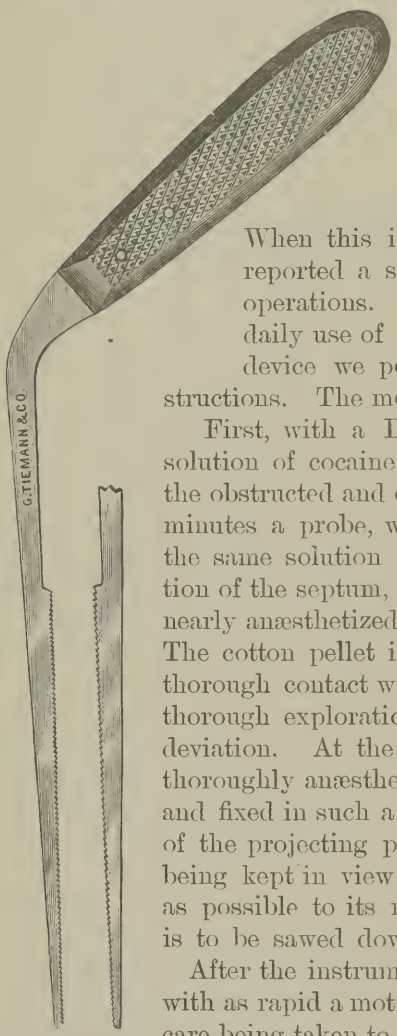

Fig. 40. — The Author's Nasal Saw.

When this instrument was first made public I reported a series of one hundred and sixty-six operations. Since that time I have made almost daily use of it, and regard it as by far the best device we possess for the removal of these obstructions. The mode of operation is as follows:

First, with a Delano atomizer a twenty-per-cent. solution of cocaine is sprayed into the nostril, both on the obstructed and on the open side. At the end of two minutes a probe, wrapped with cotton, is dipped into the same solution and swept over the projecting portion of the septum, the membrane being by this time so nearly anæsthetized as to tolerate a thorough probing. The cotton pellet is used to bring the cocaine in more thorough contact with the septum, and also for a more thorough exploration of the extent and character of the deviation. At the end of six minutes the parts are thoroughly anæsthetized. The saw is now introduced and fixed in such a position that, in cutting, the whole of the projecting portion will be removed, the object being kept in view always to reduce the septum as far as possible to its normal outlines. In other words, it is to be sawed down, as we saw a board out of a log.

After the instrument has entered, the sawing is done with as rapid a motion as it is possible to give the hand, care being taken to make a straight cut without bending the instrument. In this way the saw is carried directly down through both bone and cartilage until it emerges at the lower edge. Occasionally I have used the reverse manipulation, and sawed from below upward, when the deflection was of such a character as to interfere with entering my instrument well above the point where the projection bent from the meridian line.

After cutting, the piece is generally easily removed by the forceps, or, if not thoroughly cut through, it can be removed by slipping the loop of the snare over it. The bleeding is profuse for two or three minutes, but in no case have I had any serious annoyance from hemorrhage. In two instances, I think, I have been compelled to plug, but in only two. Hemorrhage is arrested by clot, and I simply direct my patient not to expel the clot for three hours, when I think all danger of hemorrhage has ceased.

In regard to the operation, in only a single case have I cut through the septum, which illustrates the fact of its marked thickness at the point of fracture, and, furthermore, explains why Adams' operation for straightening is so often unsuccessful.

Objection has been made to these operations that they result in ulceration. Now I wish to say, in as positive a manner as possible, that in no case have I had any such result. The subsequent treatment is nothing. The healing process requires no attention. The parts heal up kindly, and, as a rule, with no unpleasant symptoms during the process. It has been charged that bad cicatrices result. Again I say that I have seen no such result in any case. The mucous membrane reforms over the cut surface, and at the end of two months it would be difficult to recognize the fact that any cutting had been done. Too much importance cannot be laid on the necessity of a perfectly straight, smooth-cut surface. In one or two instances in operating I bent my saw, which is exceedingly flexible, in such a way as to make a hollow cut, sawing in a curve, as it were, leaving a depression on the surface of the septum. Whenever I have made such a mistake there has been exceedingly great annoyance from delayed healing, owing to the fact that mucus and bloody pus accumulated in the depression and formed crusts, and thus markedly interfered with the healing process. And herein, it seems to me, lies an objection to the rougher operation of the gouge and the forceps in removing these obstructions, as leaving an irregular surface for the lodgment of mucus and secretions. This, however, does not form ulceration. We meet with no ulcerations in the nasal cavity, except as the result of syphilis or some blood-poisoning. Delayed healing may occur, but not ulceration, after the operation; and delayed healing, I am positive, can only be the result of unskilful operating.

I will only add, with regard to the operation, that it should always be done, if possible, with the use of sunlight or some equally powerful illuminator, as it is of the utmost importance that the movement of the saw should be kept under as close ocular inspection as possible, in order that the line of cutting shall not deviate from that of the

plane of the normal septum, and this can be secured only by the aid of thorough and powerful illumination.

Dislocation of the Columnar Cartilage.

In addition to the deformities of the septum already described, two cases have come under my observation in which the deformity was so peculiar that they are worthy of being reported.

We find lying immediately below the cartilage of the nasal septum, and parallel with its lower border, a small oblong plate of cartilage, not usually mentioned in our text-books on anatomy, the purpose of which seems to be to act as a support for the integument of the columna. This may be designated as the columnar cartilage.

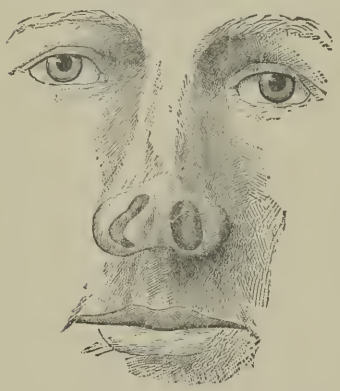

Fig. 41.—Dislocation of the Columnar Cartilage of the Nose into the Right Nostril.

The first case was that of a gentleman who reported that for two years he had noticed something growing in his right nostril. The deformity, slight at first, had continued to increase, until, when I saw him, there was a considerable degree of closure of the nostril. The facial expression was considerably altered by the deformity, and also by the anxiety to which it had given rise. On examination the columnar cartilage was found to be displaced laterally and at the same time tilted upward, in such a manner that the posterior angle projected upward into the nostril. It could be restored to position by pressure, but when this was relaxed the deformity reappeared. The appearance is well shown in Fig. 41.

The second case presented no points of difference from the first, except that the deformity was on the left side, which would suggest that the cause of the affection was the pressure of the thumb in using the handkerchief, since the first patient was left-handed, while the second was right-handed. After the deformity had been once produced, vigorous efforts at clearing the nostril by closing the other passage, would only increase the deformity.

The treatment in each case consisted in dissecting out the cartilage through a small incision made over it, resecting the redundant portion of mucous membrane, and uniting the edges with fine sutures. The result was satisfactory in each case.

Perforation of the Septum.

Perforation of the nasal septum may take place through either the bony or the cartilaginous portions. In the former case, it is probably due, in the very large majority of instances, to an ulcerative and necrotic process, the result of syphilis, scrofula, or of one of the graver constitutional dyscrasiæ, although in rare instances I have seen it occur from traumatism, the injury having caused a comminuted fracture of the vomer, with the subsequent sloughing away of the small fragments, by which a permanent opening between the two cavities was established.

Perforation of the cartilaginous portion of the septum, on the other hand, is in most instances due to purely local causes, although this region, of course, is not exempt from the invasion of syphilis and other systemic dyscrasiæ. The most common cause of this form of perforation is to be found in the existence of a projection of the cartilage into one or the other passage, whereby its prominent portion becomes subjected to the current of inspired air, laden as it is with dust and other impurities, whereby a process of erosion is established, under which the cartilage is gradually worn away until an opening occurs. This is a purely local process and involves no suspicion of a systemic taint. The existence of the erosion is attended with an annoying crust formation over its site, causing a frequent picking at the nose, by which the process of erosion is much hastened.

This process, as we see, is really a conservative effort on the part of nature to relieve the patient of an obstructive lesion in the nose, and one, moreover, which I have frequently seen attended with signal success, since the removal of the obstruction seems to be the primary effect of the process, while the establishment of a perforation is to an extent adventitious. I cannot agree with Zuckerkandl in the view that these cartilaginous perforations are due, in the large majority of instances, to an ulcerative or inflammatory action, for the simple erosion in my experience is never attended with either of these processes.

The frequency of these perforations is well shown by Zuckerkandl, who in one hundred and fifty autopsies found eight cases. As will be inferred from what has been said, I am disposed to think that the clinical significance of openings through the septal cartilage is comparatively trivial. They cause no inconvenience and indicate the existence of nothing other than a simple local process of erosion. Nor do they give rise to any symptoms, except in those rare instances in which the opening occurs in a septum which is bent somewhat

diagonally across the passage, whereby the respiratory current of air gives rise to a whistling sound, on its entrance and exit; while the erosion exists, hemorrhage is liable to occur, but this is rarely serious in character. The clinical significance of openings through the bony portion has already been sufficiently indicated.

The erosion, however, soon heals up, leaving a smooth, rounded border to the opening, which is easily recognized on inspection through the anterior nares. There are no special indications for treatment.

Abscess of the Septum.

The spontaneous development of an abscess in the septal cartilage does not, in my experience, occur. As the result of traumatism, however, it is a not infrequent accident, and moreover one which, while not involving serious danger to life, is exceedingly liable to involve the whole of the anterior cartilage in the destructive process, thereby robbing the nose of its natural support, and resulting in a deformity which becomes a source of mortification and distress during life, since the tip of the nose necessarily sinks down between the nasal bones with notable loss of normal shape and contour. The abscess is more liable to follow upon a slight blow than a severe one, although it may occur in connection with a fracture. It may also follow the application of chemical or actual caustics.

It develops rather insidiously, without any notable symptoms, or there may be a sense of soreness in the part with tenderness on pressure. As the pus sac forms it bulges into each naris in such a way as to cause more or less stenosis, and the subjective symptoms are those merely of a slight cold.

The morbid process confines itself to the cartilage alone, and the mucous membrane is rendered but slightly turgescent.

The diagnosis at times is somewhat obscure, the only morbid condition presenting being the soft, rounded, bulging mass, low down in each naris, which, being easily indented by the probe, should immediately suggest the existence of pus. This is verified by the use of the knife, which should always be promptly resorted to when there is any suspicion of pus, as even a few hours of delay may result in the extension of the morbid process to the anterior border of the cartilage, in which case a facial deformity will surely result. When the abscess is opened there is no resiliency of tissue to force out its contents. Moreover, the opening is liable to close; hence a free opening should be made and the pus forced out by pressure. Occasionally it may be necessary to pass a seton through from one nostril to

the other, directing the patient to draw it back and forth several times daily.

The duration of the disease is from three to six days, but on the first day or two the patient should be seen at least twice, or better still three times, since, as before stated, the disease develops insidiously, progresses rapidly, and the facial deformity may occur, or follow later, and in such a case, notwithstanding the exercise of the greatest care, the blame will fall upon the attending surgeon.

A few cases have occurred in my own practice. In one there was a history of erysipelas ten years previously and a severe cold accompanied by swelling of the face, which subsided in about ten days, and was followed by the gradual development of an external deformity, consisting in a sinking-in of the cartilaginous portion of the septum. In a second case the abscess was preceded by severe headaches, which lasted weeks at a time; an abscess formed on the bridge of the nose and was cut on the median line externally, pus being discharged in considerable amount. The symptoms returned months later. Upon examination the septum presented marked irregularities anteriorly and high up, and showed signs of a previous abscess, which had broken externally. A second abscess was suspected from the symptoms, but an incision produced only blood unaccompanied by pus. In the third case there was the history of a slight blow, followed in two days by inflammation and swelling and the formation of an abscess, which was opened and discharged pus. The nose then began to change in appearance, and I was consulted in regard to the deformity. I found the anterior cartilage destroyed; there was no opening, but the cartilage was thickened, soft, and pliable. The whole anterior portion of the nose had receded. There was notable stenosis.

CHAPTER XIX.

EPISTAXIS.

Etiology.—Bleeding from the nose, while in most cases a comparatively trivial affair, in others may involve grave danger to health, and even to life. As a rule, it is due to some unimportant local lesion, or it may arise as the result of some systemic condition. Epistaxis may be the result of (1) *traumatism;* (2) *constitutional or systemic conditions;* (3) *vicarious menstruation*, and (4) *local morbid conditions of the nose.*

Traumatic.—The most frequent injury which gives rise to an epistaxis is a direct blow upon the nose, causing a rupture of some of the blood-vessels, more frequently of the septum. Just how this acts it is not easy to determine. Probably, however, there is a solution of continuity at some of the sutural junctions. Among the rarer injuries which cause an epistaxis may be mentioned fracture of the base of the skull, involving its anterior fossa. In some cases, the escape of blood may be entirely beneath the mucous membrane, giving rise to a hæmatoma, which may attain sufficient size, as suggested by Schech, to protrude from the nostril.

Diathetic.—Among the diathetic conditions which may cause bleeding from the nose may be enumerated: plethora, anæmia both simple and pernicious, the hemorrhagic diathesis, purpura hemorrhagica, organic disease of the heart, and disease of the liver and kidneys. It may also occur in certain acute diseases, such as typhoid and relapsing fevers, and, according to later writers, it occurs sometimes in pneumonia.

Vicarious.—Under this head we include those curious cases in which hemorrhage from the nose is substituted for the normal menstrual flow. In the same way, nasal hemorrhage at the menopause may be regarded as to a certain extent vicarious. B. Fränkel has collected a number of cases of vicarious menstruation, which bring out some exceedingly interesting points. Thus, in a case of Kussmaul's, there was periodical nasal hemorrhage in a woman with total absence of the uterus, while in a case reported by Fricker violent hemorrhage recurred at intervals of six weeks in a girl of nineteen who had never menstruated, resulting finally in the death of the patient. Still another case was observed by Sommer, in which

monthly hemorrhage occurred from the nose in a woman during the whole period of a fifth pregnancy, while Obermeier records the instance of a young woman in whom regular menstruation occurred once at the age of fifteen, after which she had a monthly recurrence of nasal hemorrhage, lasting three or four days, ceasing only when she was pregnant.

Joal lays special stress upon the intimate relation which he believes to exist between the sexual apparatus and the turbinated bodies.

Local Lesions.—Slight deformities of the septum are probably the cause and source of an epistaxis more frequently than any other lesion met with in the nasal cavity, the apex of the projecting portion becoming the seat of a slight erosion. It is often stated that epistaxis is met with as the result of erosions which occur in connection with the incrustations on the septum in atrophic rhinitis. Neither ulceration nor erosion ever occur, I think, in atrophic rhinitis, and, furthermore, the incrustations, as a rule, do not form upon the septum. Epistaxis I regard as one of the rarest symptoms in this disease. The same, I think, may be said in regard to the ulcerations which occur in connection with syphilis and tuberculosis, the ulcerative processes in these affections rarely invading the blood-vessels. Neoplasms, with the exception of mucous polypi, may become the source of violent attatcks of epistaxis. This is especially true of fibroid tumors and the angio-sarcomata, and also the fibro- and myxosarcomata, though probably in a much less degree. In carcinoma of the nose, also, hemorrhage is a frequent symptom. Foreign bodies in the nasal passages may give rise to occasional mild attacks of epistaxis, although this is somewhat rare.

Pathology.—The hemorrhage in these cases, in the large majority of instances, is undoubtedly from blood-vessels, ruptured by either traumatism, an erosion, or an ulcerative process. The source of the hemorrhage, in the very large proportion of cases, is in the septum.

Symptomatology.—The bleeding may be somewhat trivial or in amount profuse. As the blood pours out it clots in the side from which it starts, and may gradually occlude this passage, and the blood, pouring over the septum, escapes from the opposite side. If the bleeding occurs in connection with the hemorrhagic diathesis, this is usually elicited by a history of former hemorrhages, and also may be fairly determined by the failure of the blood to form clots. The bleeding usually occurs from one nostril. Habitual bleeding from the same side would rather indicate a local lesion of that cavity, while hemorrhage from both sides would point probably to some systemic condition. Certain prodromic symptoms are occasionally met with, fulness in the head, vertigo, throbbing of the temples, head-

ache, disturbance of vision, etc. These symptoms usually occur in individuals of plethoric habit, although certain febrile affections may be preceded by an attack of bleeding from the nose. Dangerous epistaxis may occur as the result of traumatism, or from the presence of tumors, and also in the hemorrhagic diathesis, disease of the kidneys and heart, vicarious menstruation, and the continued fevers. Semon, observing an epidemic of relapsing fever, met with epistaxis as a critical symptom in thirty per cent. of the cases, and in one extremely exhausted case it was the actual cause of death.

The general symptoms which result from epistaxis depend entirely on the amount of blood lost. If excessive, faintness or complete syncope may ensue. This symptom is usually attended by a diminution or complete arrest of the bleeding, although it should always be borne in mind that, when syncope occurs, the blood may continue to flow into the air passages below, involving the danger of a new complication.

Diagnosis.—This is simple and requires no comment.

Treatment.—When the attack is of a mild character, it will ordinarily be sufficient to make an application of ice to the side of the nose from which the bleeding occurs, while at the same time a small piece may be held in the mouth, the object being to produce direct contraction of the blood-vessels. Indirectly, this may be accomplished also by cold applied to the spine. It is undoubtedly best accomplished by cold applications, although Chapman's bags filled with water at the temperature of one hundred and five degrees have been used for the same purpose. The position of the patient is of importance, I think, the best being that suggested by Moldenhauer, who advises that the patient should be placed on his side, with the head turned forward, to allow the blood to escape from the nostril In every case, when feasible, an attempt should be made to locate the bleeding point, and in many cases this will be successful, as in the majority of instances the source of the hemorrhage is near the nostril. and can be easily brought under inspection, when a pleget of cotton can be inserted and pressure made by the finger on the outside of the nose. Mackenzie advises pressure on the outer wall of the nose by means of the finger inserted into the nostril, after the manner of Valsalva. As before stated, however, I think the rule is that the bleeding surface is some point on the septum. The same writer advises that pressure be made on the facial artery as it passes over the ramus of the inferior maxillary bone. Pressure on the septum by the finger inserted into the nostril may be efficacious in directly controlling the hemorrhage by pressure on the bleeding surface, or, as Cohen suggests, by occluding the septal artery. Keetley finds the external

application of hot water, of a temperature of one hundred and twenty to one hundred and twenty-four degrees, an efficacious measure. I think, we should regard the cold application as a more powerful agent, and our efforts should be exerted with the idea of making an impression of a very decided character. Mackenzie cites a case in which an epistaxis was arrested by plunging the body into a cold bath. Certain revulsive agents, for determining the blood to the extremities, are recommended by all writers, such as a mustard plaster to the calves of the legs, immersing the feet in hot water, etc. Virtually the same effect is accomplished by a firm ligature applied around all the extremities, as suggested by Patrick.

Simpler measures failing to arrest the hemorrhage, recourse should be had to local applications to the nasal cavity. The simplest of these is the injection of cold or hot water by means of a syringe.

Astringent applications naturally suggest themselves to any one endeavoring to arrest an epistaxis, and for this purpose tannin or alum, in powder or solution, the various iron preparations, and perhaps other drugs of the same class may be used. These may be applied by means of the syringe or spray, or carried into the cavity on a pledget of cotton. I have always been averse to using these so-called hæmostatics in the nasal cavity, both on account of the unsatisfactory results obtained, and also from the fact that their local action on the healthy membrane forms an exceedingly disagreeable feature of the treatment. Moreover, the resulting mass of clotted blood, combined with the medicament used, obscures the inspection of the parts, and at the same time hampers further measures of treatment. Antipyrin is a remedy of undoubted value, and is best, I think, applied in the form of a powder, either insufflated or blown in with a tube. Of all local remedies, however, we have none whose action is so striking and so unvarying as that of cocaine, provided that we can apply it directly to the membrane, and secure its absorption to a sufficient extent to produce its characteristic action on the muscular coat of the blood-vessels, by which their calibre is so markedly diminished. Its absolutely certain constringent action on the blood-vessels is best obtained by the weaker solutions, a four-per-cent. strength being preferable. It may be applied with pledgets of cotton, carried well into the cavity, one after the other, or, better still, in an oily emulsion as follows:

℞ Cocain. hydrochlorat., ... gr. xx.
Aquæ, ... ʒ ss.
M. ft. sol. et adde
Ol. voschano,
Vel Ol. petrolati (zero) vel ol. olivi, ... ad ʒ i.
M.

This combination is easily atomized by the hand-ball atomizer and may be sprayed into the cavities. In this manner we secure a more permanent action of the cocaine.

If the foregoing measures fail to arrest or markedly modify the severity of the hemorrhage, plugging should be resorted to, before constitutional symptoms of excessive loss of blood supervene. A number of mechanical devices have been suggested for plugging the nose, in the form of air or water bags. A much simpler and more efficacious method is plugging with pledgets of cotton, or the single large tampon. The tampon possesses the advantage of being easily removed after it has served its purpose, and yet I think is less efficient than pledgets of cotton packed one after the other through the nostril, as large a plug as can be well inserted being placed behind, well into the posterior nares, followed by smaller pledgets packed directly against it and above it until the whole cavity is filled. The difficult part of this procedure is the insertion of the first plug, which should be an inch to an inch and a half long, of the size of the forefinger. This should be grasped in its whole length by a pair of slender forceps and carried through the middle meatus and well backward until near the posterior nares, when it should be packed down firmly on the floor of the nares with the closed blades of the forceps. The only difficulty about this procedure is in the subsequent removal of the plugs. To overcome this, it may be well to tie a string to the first plug only, although Schech advises that a separate string be tied to each plug. An excellent suggestion is made by Ingals, who advises the use of a strip of iodoform gauze as a tampon, for the decomposition which takes place in these plugs after remaining *in situ* for one or two days may give rise to unpleasant symptoms. The continuous tampon possesses an undoubted advantage, in that many cases are met with in which hemorrhage is not arrested by this measure; hence the rapid removal of the plugs is of importance, in order to proceed to our last resort in controlling the epistaxis, viz., by plugging the posterior nares. The first step of this manipulation requires the passing of a cord through the nares, and out through the mouth. By far the best instrument for this purpose is a soft-rubber or English catheter, of small size, which will readily pass through the lower meatus to the pharynx, where it can be seized with the forceps, or thrown forward into the mouth by a hawking effort on the part of the patient. After the catheter is in position, a stout cord should be fastened to either end and drawn through the cavity. A pledget of cotton sufficiently large to completely fill the posterior nares, perhaps the size of the last phalanx of the thumb, should be tied firmly into the continuity of the cord, and drawn up behind the

palate and firmly fixed in the posterior nares. As a rule, it will be well to facilitate the passage of the plug to its position by the left forefinger inserted behind the palate, to prevent the plug from becoming engaged against the velum. The remaining step consists in plugging the anterior nares firmly. The object of leaving the cord in the mouth, of course, is to enable the operator to remove the plug when necessary.

The plugs should be allowed to remain in position not longer than forty-eight hours, when they may be with safety removed. I have never seen any accident follow plugging of the posterior nares, although Mackenzie cites a number of instances in which the procedure caused extensive gangrene of the face, tetanus, pyæmia, facial erysipelas, and in some cases resulted in death; while Gellé reports a case of double purulent otitis media resulting from this procedure.

Too much emphasis cannot be laid on the importance of searching for the bleeding point in every case of epistaxis before any measures are employed for arresting the hemorrhage. When the bleeding point has been located, the hemorrhage may be arrested, as a rule, by simple pressure, although in certain cases a local application is preferable in avoiding the discomfort attendant upon the insertion of plugs. Chiari expresses preference for the galvano-cautery in these cases, while Robinson condemns it, justly I think, for certainly a simple stick of nitrate of silver, or crystal of chromic acid, will often answer the purpose equally well, and is much more easy of manipulation, or, if these fail, the ordinary silver probe, heated with a spirit lamp to a dull heat, offers most of the advantages of the galvano-cautery, and, moreover, is always available.

In addition to local measures, there are certain internal remedies, such as tannin, gallic acid, acetate of lead, iron, ergot, etc., which are regarded as possessing the property of controlling hemorrhage, but I think little reliance can be placed upon them. Certainly my own experience has failed to demonstrate their usefulness. The use of ergot has been somewhat warmly advocated by Mackenzie, and probably few of us, in severe cases of hemorrhage, would consider our whole duty fulfilled without the hypodermatic administration of twenty minims of the fluid extract of this drug, repeated according to circumstances. Opium, also, in some of its forms, may well be given, both on account of its supposed action in contracting the blood-vessels and also on account of its anodyne effect, wherein I think lies its chief value. I should fully agree with Mackenzie in regard to the tincture of opium as the best form for its administration. Fränkel cites instances in which periodic attacks of epistaxis, which he regards as having been due to malarial origin, were cured by the

administration of quinine. Harvey also reports a somewhat similar case, in which the epistaxis recurred daily at 3 P.M for seven days, when it was finally arrested by the administration of anti-periodic remedies. When the loss of blood is very great, transfusion or infusion naturally suggests itself as a means of restoring the vitality of the patient rather than for the arrest of the hemorrhage, and yet Mackenzie cites a case reported by Mosler, in which the hemorrhage was arrested by the transfusion of blood. The infusion of a saline solution or of warm milk would probably answer the same purpose.

CHAPTER XX.

FOREIGN BODIES IN THE NASAL PASSAGES.

Either by accident or by the curious instincts of childhood, a foreign body in the nose is a not infrequent condition demanding surgical interference. In the large majority of instances these bodies are inserted through the nostril intentionally, by mischievous children or hysterical females, while others make their way into the cavities through the posterior nares, in an obscure and curious way. Thus, in vomiting, a portion of the contents of the stomach is frequently thrown into the nasal fossæ, and some parts of it may remain. Not long since, I removed a deciduous tooth from the nasal cavity in a gentleman aged thirty-seven, which had been the cause of a purulent catarrh for twenty-five years. In this case, the tooth, becoming loosened in its socket, had been swallowed at the age of twelve, and probably afterward thrown into the nasal cavity in the act of vomiting. A somewhat curious case is reported by Lowndes, in which a ring was found impacted in the posterior nares of a child of fifteen months. Tampons may be left in the nasal cavity by plugging. As a rule, these loosen themselves and come away spontaneously, although in one case I removed a tampon which had been inserted for the purpose of controlling an epistaxis, and which had been the source of an exceedingly offensive purulent discharge from one of the nasal cavities for two years. Similar accidents are alluded to by Moldenhauer and Moure. The objects which are inserted into the nose anteriorly are shoe buttons, beans, pebbles, and, in fact, any object whose size the nostril admits. Among rarer accidents are those in which a foreign body makes its way into the nasal cavity through the external walls of the nose, as in the case quoted by Moldenhauer, in which a splinter of wood made its way through the canine fossa and was removed from the inferior meatus a month later. In the same way a spent bullet, fragments of iron, or other objects may make their way into the nasal cavity by penetrating the bones of the face.

Symptomatology.—The immediate effect of the presence of any foreign body in the nose is to excite more or less profuse sero-mucous discharge, which is soon converted into a muco-purulent or bloody

discharge as the result of the ulcerative process. The presence of the object itself causes more or less stenosis of the passage, which is greatly increased by the swollen condition of the mucous membrane which it causes, and still more by the muco-purulent secretions accumulating in the cavity. Wherever the foreign body lodges the membrane becomes to a certain extent tolerant of it, and reflex symptoms, such as sneezing and watery discharges, are not excited by its presence. Olfaction, furthermore, is not liable to be affected. Facial neuralgia is occasionally present, and may prove an exceedingly distressing symptom. Erosion of the nostril and lip, as mentioned by Schech, is not infrequently caused by the acrid discharges from the nose. This is especially observable in young children. The same writer includes epiphora, conjunctivitis, and allied affections among the symptoms of foreign bodies in the nose. These I should regard as somewhat rare.

Diagnosis.—The occurrence of a chronic purulent discharge from one nostril should always give rise to the suspicion that it is due to the presence of a foreign body, for in those diseases of the nose which are characterized by a purulent discharge the rule is almost universal that it is bilateral. Furthermore, the discharge caused by the presence of a foreign body in the nose is somewhat peculiar, in that mixed with the pus are found small flocculent whitish masses of inspissated mucus, presenting a somewhat cheesy appearance, which is characteristic. The ulceration in the nasal cavity is not progressive, and rarely I think extends through the thickness of the mucous membrane. Occasionally the pressure may produce perforation of the cartilaginous septum, but never a true necrosis of bone. The diagnosis can only be definitely made by the use of a probe. Cocaine should always be applied after cleansing the cavity as thoroughly as possible by means of a syringe or spray, when thorough probing is easily tolerated. In the case of young children, I think it is always wise to administer a few whiffs of chloroform, sufficient to produce primary anæsthesia, before any attempt is made at exploring the cavity, for thus a quiescent condition of the child is obtained, which will enable the operator to ascertain the presence and locality of the foreign body by an exceedingly brief exploration with the probe, without injury to the soft parts, which would be almost an impossibility with a struggling child.

Treatment.—As before stated, if the patient is a child, a general anæsthetic should always be given in order to secure its thorough quiescence. If the body is small and lodged anteriorly, it will usually be easily seized by a pair of mouse-toothed forceps. If the object prove too large to extricate through the nostril, it is quite feasible

to cut it in two by a snare or to crush it and remove it piecemeal, thus avoiding the necessity of forcing it through into the pharynx, as would otherwise be incurred, or of enlarging the nostril by the Rouge or Dieffenbach operation, although, if the object be too hard to crush with the snare, and too large to withdraw through the nostril, one of these procedures may be necessary. A simple instrument is the curette devised by Gross. This instrument has on its outer extremity a small screw for insertion into the object, an ingenious device, provided the screw can be inserted without forcing the body back into the nasal cavity. In those cases in which the object is lodged in the posterior nares it may be dislodged with the finger in the pharynx, worked in connection with the probe through the nose, or seized by a pair of curved forceps passed behind the palate, directed either by the finger or by the rhinoscopic mirror. The use of douches to dislodge a foreign body is not only of questionable efficacy but probably involves a certain amount of risk, in that the ordinary dangers of the douche are increased by the obstruction. Temain avoids the dangers of the douche by passing a catheter through the nose beyond the foreign body and projecting a stream of water against it from behind, in this manner endeavoring to force it out. In very young children who cannot blow the nose vigorously this may be done for them by the use of a Politzer's bag, blowing into one nostril, or by blowing into the child's mouth, although either of these procedures should be carried out very carefully. After all, however, a foreign body will be usually extracted by means of the forceps or snare, and these supplemental methods need rarely be called into use.

CHAPTER XXI.

RHINOLITHS.

When a foreign body has become impacted and remains for a long time in the nasal cavity, it becomes what we know as a rhinolith. The frequency with which nasal calculi are reported in our later literature would seem to indicate their somewhat common occurrence. In most of the cases given in the various reports a nucleus was found. In other cases no apparent nucleus was detected, yet I think it must have existed; for, in the case of a large rhinolith removed by the author on section, it showed a small cavity which had been occupied by a kidney bean, of which scarcely any trace was left. A small mass of hardened mucus, as suggested by Cohen, or a blood clot, as suggested by Moldenhauer, may be the starting-point in one of these formations, of which little trace would be left. As a rule, these formations are met with singly, the only exception being a case reported by Axmann, in which the patient, suffering from periodic headache, was relieved by the spontaneous expulsion of a number of rhinoliths.

Symptomatology.—A consideration of the symptoms due to the presence of rhinoliths involves mainly questions already discussed in the chapter on foreign bodies, with the additional factor that a rhinolith growing within the nasal cavity attains a large development, which consequently involves certain additional symptoms due to the mere presence of the growth. These additional symptoms occur as the growth crowds the soft parts and even bone before it, giving rise at the same time to extensive ulceration and to a profuse purulent discharge, oftentimes of an exceedingly offensive character, which makes its exit through the nostril into the fauces, or through an artificial opening in the external face or in the palate. The neuralgia and paralysis which accompany the development of a rhinolith are, of course, dependent on pressure either on the nerve trunk or peripheral filaments.

Diagnosis.—The development of these formations is somewhat slow, and hence they are usually met with in adult life, though they may occur in childhood; for while it is in young children that for-

eign bodies are most frequently met with in the nose, the conditions favorable to the development of a calcareous deposit do not seem to obtain in most instances until later in life. The diagnosis is usually easy, and depends mainly on investigation by means of the probe, cocaine being applied as thoroughly as feasible. The impact of the probe will reveal the location and, to an extent, the size of the rhinolith, while the grating sensation will determine its character. The only source of error would be in the presence of necrosis of bone, or calcareous degeneration of the mucous membrane. These conditions, however, should be easily recognized, since their location is on the walls of the nasal cavity.

Treatment.—The treatment of a rhinolith is essentially the treatment of any foreign body. As a rule, these formations are entirely too large to extract through the nostril, and hence crushing becomes necessary. In many instances this is easily done by an ordinary duck-bill forceps, or the snare écraseur may be used, as suggested in connection with foreign bodies. This is applicable to soft formations, and those in which the nucleus is large and the outer incrustation is thin. When the formation is dense and solid, more powerful mechanism will be required for crushing them. For this purpose, any of the ordinary lithotrites designed for crushing urinary calculi are applicable. The crushing of a hard nasal calculus is by no means a trivial operation, and in most cases will require a general anæsthetic. Its dangers are not necessarily great, and yet Mackenzie states that extensive hemorrhage attended his operation, together with the development of facial cellulitis on the following day.

CHAPTER XXII.

PARASITES IN THE NASAL CAVITIES.

Although living creatures which either make their way into the nasal cavity or are developed from ova deposited there are not in the strict sense parasites, yet the term is used by most writers to describe this curious condition which, while one of the rarest events in temperate regions, is of somewhat frequent occurrence in tropical climates.

Many cases have been reported in which the larvæ of different dipterous insects had developed in the nasal fossæ from ova deposited by the parent fly.

Fränkel states that patients suffering from ozæna are more liable to this invasion in temperate climates. The diptera which deposit their ova in the nasal cavity in temperate regions are the musca vomitoria, musca carnaria, and probably in certain cases the œstrus, or gad-fly; in tropical climates the lucinia hominivora is the most active.

The warm cavity of the nose provides a favorable surrounding for the hatching of the ova, and the larvæ soon commence their work of destruction, invading the whole nasal cavity, and, making their way into the accessory sinuses and communicating passages, destroy not only the mucous membrane but the periosteum, and cause necrosis of the bone. If not arrested, they travel still farther, making their exit from the nose and invading the cellular tissue of the face and scalp.

Symptomatology.—The earliest symptom due to the presence of maggots in the nose is a sense of formication, followed by frontal headache, which rapidly assumes an exceedingly distressing character. Fränkel quotes Weber as stating that the pain in this affection is very great. Muco-purulent bloody discharges set in very soon, and increase with the progress of the destructive operations of the larvæ. Epistaxis, oftentimes of a very serious character, may occur, the result of invasion of the blood-vessels. Swelling of the nose and face occurs, the maggots burrowing in these tissues. The swellings asume the character of localized abscesses. Grayson alludes to the possibility of confounding the affection with idiopathic erysipelas.

In the commencement of the attack constitutional symptoms are not marked, though on the second or third day general shock is present with marked depression of the vital powers. Pus formation in the cellular tissue is evidenced by the occurrence of chilly sensa-

tions or a well-developed chill. There is a rapid and feeble pulse, with early fever setting in, and as the disease progresses a temperature of 102° to 103° F., or even higher. A fatal termination of the disease is due, probably in all cases, to the supervention of meningitis, although it would seem that the very extensive suppuration going on in the cellular tissue of the face and scalp might result in a septic condition sufficient to produce death without the occurrence of inflammation of the meninges. Meningitis in many cases is probably due to extension of the inflammatory process by continuity of tissue after the invasion of the ethmoidal or sphenoidal sinuses.

Diagnosis.—The diagnosis is comparatively simple, and one should be able to recognize the presence of these creatures before any serious damage has been done, although in most of the grave cases the patients do not come under observation until serious mischief has resulted. While the maggots confine their activity to the nasal passages alone, their further progress can be arrested easily. When, however, the accessory sinuses are invaded, or the cellular tissue, they are far more difficult to deal with. These cases relate entirely to the larvæ of the diptera. The other insects which are found in the nasal cavity are comparatively harmless. Thus, Cochran reports a case in which the expulsion of about fifty screw-worms from the nose gave entire relief to a patient suffering with apparently a severe influenza with high fever; while Thiedemann has collected evidence of the existence in the nose of centipedes, earwigs, and larvæ of the beacon-beetle. Leeches have been found in the nose as cited by Mackenzie, while lumbricoids have been ejected into this cavity in the act of vomiting.

Treatment.—Chloroform diluted with an equal amount of water and injected into the nose has destroyed the larvæ in every case in which it was tried when the creature had not burrowed beyond the reach of the drug. Mackenzie suggests that this agent might be used in full strength, although the patient should be anæsthetized first, as otherwise the application would be too painful. Inunctions of mercury have effected a cure, even after the maggots had invaded the cellular tissues of the face and skin and destroyed the eyes. The immediate effect of chloroform is so satisfactory that the trial of other remedies will rarely be justified. Grayson recommends camphophenique in connection with this, as thorough disinfection of the cavity by douches is naturally of much importance.

When the maggots have reached the accessory cavities these should be opened, if necessary and feasible. Localized abscesses on the face or scalp will be treated under the ordinary rules of surgical procedure.

CHAPTER XXIII.

SYPHILIS OF THE NASAL PASSAGES.

The manifestations of syphilis in the nasal cavity are: (1) the primary lesion, (2) erythema or coryza, (3) the mucous patch, (4) the superficial ulceration, and (5) the gummy tumor leading to (6) deep ulceration and necrosis.

The division of syphilitic lesions into secondary and tertiary is purely arbitrary; the mucous patch and the superficial ulcer, which are usually regarded as secondary lesions, are frequently found in the later stages of the disease, while the gummata with deep ulceration and necrosis not infrequently occur early in the history of the malady.

The Primary Lesion.

Chancre of the nose is naturally one of the rarest of lesions, and could only occur as the result of a most untoward accident. In two thousand two hundred and forty-four cases observed by Bassereau, Clerq, Lefort, Fournier, and Ricord, the lesion was found in the nose twice. In such cases the virus is conveyed by the finger nail, as in a case reported by Moure. The chancre in these cases is found upon the cartilaginous septum. It seems that when the nasal passages become the seat of a primary syphilitic lesion, the infective process assumes a somewhat more efflorescent character, and the general febrile movement which attends the onset of the disease is of a far more aggravated character; in Moure's case the ulcer presented a large granular mass, which bled easily upon touch, and which not only produced notable stenosis, but also pressed against the ala of the nose to such an extent as to produce external deformity.

Diagnosis of the Primary Lesion.—Our clinical knowledge of chancre of the nose is based on so few recorded cases that definite positive conclusions cannot be well drawn. The diagnosis, however, may be based on the gross appearance of the ulcer and the constitutional disturbance. The existence of an ulcer in the nose with a hard base and granular surface, bleeding easily on touch, and limited in extent, would suggest either tuberculosis, malignant disease, or syph-

ilis. Tuberculosis occurs only as secondary to a pulmonary deposit, and furthermore an examination would show the existence of the characteristic bacillus. Malignant disease, whether carcinoma or sarcoma, is rarely stationary, and its development is liable to be attended with attacks of profuse epistaxis, a symptom not met with in chancre. The enlargement of the submaxillary glands on the side affected, early found in chancre, is not usually met with till late in the clinical history of cancer, and rarely if at all in sarcoma. Of course the diagnosis is completely established if the characteristic cutaneous eruption comes on at the end of from six weeks to three months.

Syphilitic Coryza or Erythema.

This occasionally occurs in the early stage of syphilis, but presents no prominent features which enable us to recognize it as due absolutely to the specific virus.

It occurs from three weeks to six months after the primary sore, and usually in connection with a roseola, although I think there can be no doubt that we may have a coryza in connection with the later development of syphilitic disease, such as mucous patches, periostitis, or the superficial ulcer.

The Mucous Patch.

This manifestation of syphilis shows an unmistakable tendency to develop in the region of muco-cutaneous junctions, such as the anus, the lips, or the vulva: hence we would naturally expect to find it about the margins of the nostrils, yet, as a fact, this is an exceedingly rare location for a mucous patch. Davasse and Deville, in reporting one hundred and eighty-six cases of this lesion occurring in females, have found that in only eight cases was the nasal mucous membrane invaded, while Bassereau showed that out of one hundred and thirty cases of this lesion observed in males, the nasal mucous membrane was not affected in a single case. In my own experience, I have never seen a nasal lesion in which I felt warranted in making the diagnosis of a mucous patch. If the lesion should occur, however, I take it, it should be recognized as presenting the same appearances as a mucous patch when seen in other portions of the air tract.

The Superficial Ulcer.

In the superficial form we meet with an ulcerative process in the nasal cavity, commencing apparently in the surface of the mucous membrane, which invades the tissue by a slow process of destruction. This is an exceedingly rare lesion, although undoubtedly met with.

It occurs usually in what is called the secondary stage, namely from one to three years after the primary sore, and its occurrence is explained by the breaking down of a mucous patch. I am disposed to think that a superficial ulcer belongs to a later stage of syphilitic disease, and that it is due to the breaking down of a superficial gummatous deposit, for that we have an ulceration of this form, differing not only in its gross appearances, but in its clinical history, from the deep ulcer, cannot be questioned. The primary gummatous infiltration being superficial in character, would give rise to no notable symptoms which should call attention to a disease going on in the membrane, and, furthermore, would present no notable appearances on direct inspection, and our attention is therefore first directed to the fully developed ulcer. This form of ulcer is usually met with on the septum, although it is to be found on the floor of the nose or on the surface of the turbinated bodies. Its borders are moderately well defined, and the mucous membrane surrounding it is perfectly normal in appearance, there being no areola of redness. The edges of the ulcer are neither sharply cut nor depressed. Its surface, however, is somewhat depressed in the centre, although its periphery is usually flush with the surrounding membrane. Its surface is covered with a coating of thick, stringy, and grayish-yellow muco-pus, usually discolored by the deposit of impurities from the inspired current of air. If this is removed, the cleansed surface will show a grayish-pink color. It is slightly sensitive to the touch and bleeds easily. It shows no marked tendency to extend and but little destructive activity. Occasionally, the superficial ulcer would seem to extend deeply, and result in an involvement of the periosteum and an exposure of bone. This destruction of deeper tissues, with the resulting necrosis of bone, is due, as has been so clearly demonstrated by Schuster and Sänger, to the fact that, coincident with or even later than the superficial gummatous deposit, there occurs a gummatous deposit in the deep layer of the membrane, which results in the breaking down of the deeper tissues and the setting in of an ulcerative process there, after the superficial ulcer has fully developed.

That the superficial ulcer is due to the gummy deposit, I think, is further shown by the fact that the administration of mercury has but feeble influence in controlling the morbid process, but that it yields promptly to the administration of iodide of potassium, as is the case with the deeper gummatous deposits.

The Gummy Tumor.

Under this designation ought to be included those manifestations of late syphilis which indicate an exceedingly active condition of the

specific virus in the system. No portion of the nasal cavity is free from this deposit, although, in the large majority of instances, the deposit occurs on the septum, involving both the bony and the cartilaginous portions. It may also occur on the turbinated bones, or on the floor of the nose. The gummatous deposit shows a more or less well-marked tendency to rapid degeneration into an ulcerative process, depending somewhat on the locality of the deposit. Thus, in the pharynx, owing to its exposed situation, the development of the gummatous deposit into an ulcerative process is so rapid that a gummy tumor is rarely observed in this region. In the nasal cavity, on the other hand, a gummy tumor is so thoroughly protected that the morbid process is exceedingly slow, and the existence of the tumor is usually recognized before ulcerative action has taken place. This lesion belongs essentially to what is called the tertiary stage of syphilis, namely, that from five to fifteen years after the primary lesion.

Symptomatology of the Gummy Tumor.—When the deposit occurs upon the septum, it does not usually give rise to any marked pain, although there is usually a more or less well-marked sense of discomfort with nasal obstruction. When the deposit is upon one of the turbinated bones, the pain is apt to be more marked and usually aggravated at night. The pain is of a deep boring character, and is usually very distressing. Ordinarily the symptoms are sufficiently prominent to direct the attention of the patient to the part.

Diagnosis.—A gummy tumor of the turbinated tissues is not easily recognized on gross inspection, for it is usually small and situated well back in the nasal cavity. In these cases, the diagnosis will be based on the previous history of syphilis, with stenosis, deep-seated pain extending to the side of the face, with nocturnal exacerbations, together with tumefaction over one of the turbinated bones, usually the lower, which, on inspection, presents simply the round swollen aspect of hypertrophied tissue. The impact of the probe, however, reveals the tumefaction to be of a more solid character than turbinated hypertrophy.

When upon the septum, the tumor, as before stated, attains a much larger size than when it occurs in other portions of the cavity, and presents as a large, rounded, prominent mass, projecting from the wall of the septum, and more or less completely occluding the nasal passages. In contour it is round and smooth, and is covered with a mucous membrane, usually of a normal tint. In other cases, we may find it showing evidence of deep venous injection, giving rise to a reddish or purplish hue. This, however, is more characteristic of the smaller growths. In a certain proportion of cases the lesion is upon

both faces of the septum, although, as a rule, it is unilateral. There is no marked tenderness on pressure, and the growth presents a somewhat hard, semi-elastic, cartilaginous condition. The mucous membrane covering the growth is usually unbroken. A gummatous condition of the septum may be confused with deflected septum and sarcoma. In a deflected septum the tumor is much harder to the touch and, furthermore, will show a corresponding concavity on the opposite side, which is not present in the case of a gumma. These cases, however, often very closely simulate a sarcoma, and in one case in my own experience a diagnosis of sarcoma was made; the microscope, however, revealed the mistake. As a rule, a sarcoma presents a softer, more pedunculated mass, bleeding easily upon touch, and is somewhat movable. Moreover, its attachments are apt to be much higher up in the cavity. An absolute diagnosis can be made only with the microscope.

Pathology.—The essential pathological lesion, which constitutes a gummatous deposit, is an infiltration of the mucous membrane with small round-cells, or inflammatory corpuscles, which invade not only the epithelial layer but also the mucosa proper and the deep layers of the membrane or periosteum, and even the bone tissue itself. The extent and distribution of this infiltration would seem to depend somewhat on the activity of the specific virus in the system. Thus, as we have seen, when the activity of the virus is limited, the cell infiltration only invades the epithelial layer of the membrane, giving rise to the superficial ulcer. On the other hand, when we have a greater activity of the specific virus in the system, the cellular infiltration which we call a gummatous deposit invades the whole thickness of the mucous membrane, giving rise to more or less prominent tumefaction. In addition to this, the same process invades the vascular structures of the membrane, more especially the nutrient arteries. According to Sänger, we occasionally find, in the deep layers of the membrane, in addition to the small-round-cell infiltration, a certain number of spindle cells, deposited in or near the periosteal layer. Sänger further states that, as the result of the oblitration of the arteries, we have a damming back of the blood, which may give rise to a hyperæmic condition of the tissues beyond, and that this is followed by localized extravasations of blood, and, as an occasional ultimate result, small cyst formations.

Course and Duration.—A gummy tumor in the nasal passages runs a somewhat chronic course. This is due, as we have said, largely to its location. It develops somewhat rapidly, attaining its full growth in probably a very few days, after which it may remain quiescent for weeks and even months. In one case which came under

my own observation, the tumor had existed for twelve months, apparently without great change, giving rise merely to the ordinary symptoms of nasal stenosis with nocturnal pains, and some occasional coryza. Probably a duration of six months is to be regarded as beyond the average. As the result of the peculiar anatomical features of the deposit the subsequent history of a gummatous deposit consists of a breaking down at its centre, which, gradually extending to the surface, results in the development of an ulcerative process. Endarteritis following, complete obliteration of the arteries is only a final result. When this, however, occurs, nutrition is arrested in the mass, necrosis ensues, and the whole of the tissue whose nutrition depended previously on the blood supply from the diseased artery becomes necrotic, breaks down, and sloughs away, leaving the characteristic broad crater-like ulcer which we recognize as the deep ulcer of syphilis.

The Deep Ulcer of Syphilis, and Bony Necrosis.

This lesion, arising directly from a gummy deposit, presents the same clinical history. It occurs usually from ten to fifteen years after the primary sore, although among races in whom syphilis has been prevalent for ages, without controlling influence of proper treatment, it seems to possess a special virulence, and hence runs a more rapid course. Thus, Chinese syphilis is commonly regarded as one of the most virulent forms of the disease; clinical observation shows it to be so when contracted by Europeans, with whom it runs an exceedingly rapid course, the tertiary symptoms developing very early. This peculiar feature of syphilis, however, is exceedingly rare among the European races, although Mauriac has observed a deep ulceration followed by necrosis of the nasal bones seven months after the primary lesion.

Its most frequent location is fortunately upon the septum. The first effect of the breaking down of the gumma is to involve the whole thickness of the mucous membrane, and the periosteum as well, in the ulcerative process. After the ulcerative process becomes established, there is shown a tendency to extend both laterally and deeply, resulting in the destruction of neighboring tissues and the involvement of the bone beneath. Or, in case there has been a primary gummatous deposit in the bone, we have a bony necrosis as an early symptom. The destruction of tissue is by no means rapid, and the extension of the ulcer is probably due, to a large extent, to the subsequent breaking down of those portions of the membrane which have previously become infiltrated with the gummatous deposit. For I

think it is exceedingly doubtful if we ever have a further gummy deposit, after the first deposit occurs, the syphilitic explosion, as we may call it, expending itself when the first gummy tumor develops. An additional feature, which I think is characteristic of the deep syphilitic ulcer, is that it shows a marked hesitancy in transgressing anatomical boundaries. This, probably, is due to the fact above stated that the ulcerative process is limited by the original gummy deposit. Certainly these ulcers do not extend beyond the nostril to the skin, nor do they extend beyond the posterior nares into the pharynx.

Symptomatology of the Deep Ulcer.—With the breaking down of the gumma, the peculiar boring pains with nocturnal exacerbations disappear, and there is a profuse sanguino-purulent discharge mixed with the blackened shreds of necrotic tissue. These show a tendency to accumulate on the face of the ulcer in large masses, which, drying, form crusts. These crusts are exceedingly offensive; indeed their odor is intolerable, especially when the disease has extended to the bone. This odor is present about the person of the patient at all times, and is in every way characteristic. With the bloody crusts small spiculæ of bone, and later large sequestra, may be expelled, either through the nose or through the pharynx. As the ulcer extends, the crusts become much larger, and are discharged with difficulty, the cavity becoming blocked up with a great mass of bloody pus and necrotic tissue, giving forth a hideous odor until relief is obtained by the interference of the surgeon.

The sensibility of the nasal cavity seems to be notably diminished in syphilitic disease. The sense of smell is usually abolished or markedly impaired.

Deep syphilitic ulceration, unless arrested very early in its career, results in necrosis of the bony tissue or cartilage beneath. If it occurs upon the turbinated bones, the necrosis involves no external deformity, but confines itself simply to the destruction of such portion of the bone as may be involved in the original gummatous deposit. When the ulceration occurs upon the cartilaginous septum, necrosis occurs very early and runs a somewhat rapid course, usually involving the whole of the cartilaginous portion of the septum in the destructive action. The result of this is that the tip of the nose is robbed of its support and sinks in, producing the peculiar deformity so easily recognized as the result of this lesion. In certain cases, although exceedingly rare, the destruction of the cartilaginous septum is attended with a destruction of the columna of the nose, thus converting the two nostrils into one single orifice over which the sunken tip of the nose falls. If the original gummatous deposit is circum-

scribed in extent, perforation of the septum occurs without causing any external deformity. When the bony septum is involved the destruction may be limited to a portion of the septum, or complete destruction of the vomer may take place without any external deformity. In other cases, however, the nasal bones are also involved in the morbid process, probably as the result of the original deposit of gummatous material in the bones themselves. When they are destroyed the resulting external deformity is quite as noticeable as the one previously described; the bridge of the nose sinks in, leaving the tip of the nose intact. The sinking in of the bridge is attended with a certain amount of atrophy of the tissues of the external nose, and there is left simply a rounded elevation representing the original bony bridge, which thus throws the unchanged nasal tip into greater prominence. I have never seen this form of external deformity result from gumma of the nasal bones alone, if such a thing ever occurs. The nasal processes of the superior maxillæ are usually also involved to a certain extent in the same necrotic process which attacks the nasal bones.

Diagnosis of the Deep Ulcer.—After the ulcerative process has commenced in a gummy tumor, the destruction of tissue goes on very rapidly, until the whole growth has broken down and developed into the characteristic deep ulcer or tertiary ulcer of syphilis, which now presents appearances so typical in character as to render the diagnosis comparatively easy, and the subjective symptoms are usually sufficient to establish the diagnosis beyond much question.

The areola of the ulcer is characteristic in its exceedingly bright and glassy-looking red color, which extends some distance beyond its border. The gross appearances are quite sufficient to establish the diagnosis.

It has already been shown that the deposit extends very deeply through the mucous membrane, and usually involves the deep layer or periosteum. Hence, the bone is usually found to be denuded—a fact which is easily established by the use of a probe, which should always be used both for determining the existence of denuded or necrosed bone, and, furthermore, to establish the extent of tissue which the ulcerative process involves. If the disease has existed for a sufficient length of time to result in the formation of a sequestrum, this fact is also determined by means of the probe, as the mobility of the mass is thus easily ascertained. The ragged tissue about the edges of the ulcer occasionally develops a typical myxoma; in rare instances there are groups or masses of polypi, which for a time may obscure the diagnosis. Their removal is easily accomplished, when the diseased action beneath is readily made manifest. In addition to this,

a certain exuberant granulation tissue is noticed in the majority of cases, more or less efflorescent in character, upon the ragged ulcerating edges, and extending over the diseased surface of the ulcer. This presents the typical appearance of granulation tissue, except that it is somewhat redder, and is usually covered with the offensive secretion from the ulcer. It is of a somewhat yellowish color, and bleeds easily on being touched with a probe.

Another appearance quite characteristic of the tertiary ulcer in the nose is the accumulation of a peculiar, clear-white substance, having much the appearance of potted cheese. This is found above and beyond the ulcerative process, and seems to consist of mucus which has been imprisoned in the narrow portion of the nasal cavity, and has undergone cheesy degeneration. This comes away in large flakes upon cleaning the ulcer. This condition is almost pathognomonic of a syphilitic ulcer, as I have rarely seen it in any other form of diseased action on the nose.

Course and Duration of the Deep Ulcer.—As before intimated, I am disposed to think that the deep ulcer of syphilis simply involves those tissues which had originally been the seat of the gummy deposit, and that there is no tendency to spread to the neighboring tissues. The disease runs an essentially chronic course, after the ulcer has been established, owing to the fact that the morbid process has extended to the bone, resulting in its denudation and subsequent necrosis. Whether the original gummy deposit be in the bone or is simply confined to the mucous membrane or the periosteum, necrosis is the result. In the former case, however, it would involve a larger and perhaps more rapid ulcerative action.

If the disease is located upon the vomer, it may result finally in producing simply a bony sequestrum, which causes a perforation of the vomer, or it may involve the whole bone and a certain portion of the hard palate, causing perforation and the appearance of the disease in the roof of the mouth. I am disposed to think that this complication arises as the result of the original gummy deposit involving a small portion of the floor of the nose, or the upper surface of the hard palate.

As regards the danger of external deformity resulting from syphilitic disease in the nose, this I think is clearly indicated by the extent of the original lesion. Thus, deformity may arise from the destruction of the bony or cartilaginous septum, or the nasal bones, or both. If the original gummy tumor has involved these, an external deformity is inevitable. The prognosis, then, as regards external deformity, depends entirely upon the location and extent of the ulcer. Thus, even a small ulcer involving the nasal bones would result in

deformity, while a large ulcerative process located upon the posterior portion of the vomer involves no danger whatever of such an accident. Again, an ulcer of considerable size, located upon the central portion of the cartilaginous septum, may produce a large perforation, leaving a mere ring of cartilage. If, however, this ring is complete anteriorly, an external deformity need not result. If, on the other hand, the disease extends to the anterior edge of the cartilaginous septum, a sinking-in of the tip of the nose is inevitable. Original syphilis of the nose, as a rule, remains a syphilis of the nose. An extension, for instance, through the anterior nares to the integument never directly occurs. The same I think can be stated in regard to any extension into the pharynx. As we have already seen, apparent extension to the oral cavity is the result of an accident, and is not really an extension of the disease. An interesting question, in this connection, is the danger of septic absorption from the exposed bone, constantly bathed as it is in a purulent fluid. This is ordinarily regarded as constituting a condition especially favorable for the production of septic infection, and yet as a matter of clinical observation I think this complication is an exceedingly rare one. Herman Weber has reported a case of syphilis of the nose which establishes beyond question the possibility of a general septic infection having its origin in necrosis in the nasal cavity. Though undoubtedly cerebral symptoms are present in many cases of syphilis of the nose, I quite agree with Schuster in his statement that they are to be regarded as reflex manifestations rather than as evidence of brain lesion.

Treatment.

The Primary Lesion.—In dealing with a hard chancre in the nose, there are no indications for treatment, other than the use of simple lotions for keeping the parts clean. If the ulcerative process is active, this may be controlled by the local application of iodoform or iodol. If the diagnosis has been fully established by the appearance of the characteristic syphilitic eruption, the patient should be put on a course of mercurial treatment. Caustics should not be used, in that no good purpose is thus accomplished.

The Coryza or Erythema.—A syphilitic coryza subsides readily under general medication, and as a rule requires no local treatment.

The Mucous Patch.—The indications for the treatment of a mucous patch here, as elsewhere, consist in its thorough and complete destruction, by means of chromic acid or some equally efficient caustic, applied daily until the morbid process is completely arrested.

The Superficial Ulcer.— The essential feature of treatment in this

form of ulceration consists in the administration of iodide of potassium, commencing with a dose of fifteen grains, three times daily, after meals. Its efficacy is easily tested by watching the progress of the ulcer. If the morbid process is not immediately brought under control, the dose should be increased on the third or fourth day to twenty grains, and if necessary at the end of a week to twenty-five grains, although cases are very rare in which the administration of doses larger than fifteen grains will be demanded in this form of ulcerative action, as I am disposed to think a superficial gummatous deposit indicates that the specific virus in the system is not specially active. In connection with the iodides, either the bichloride or biniodide of mercury is to be administered, in doses of one-sixteenth of a grain three times a day. After the ulcer is completely healed, the further administration of the iodides is not indicated. The mercurial treatment, however, of course, should be continued for from eighteen months to two years.

The patient should be seen daily and the progress of the disease watched with care, not only to test the efficacy of the general remedies, but also to guard against the very possible mistake of regarding a deep ulcer as one of the superficial variety. The surface of the ulcer should be kept thoroughly clean by the use of some simple cleansing lotion and powdered daily with iodol or iodoform.

The Gummy Tumor.—The early recognition of a gummy tumor is of special importance. Few lesions in syphilis are more directly amenable to internal medication than this manifestation; under iodide of potassium it rapidly disappears. I do not entirely agree with those who advocate the use of this drug in extremely large doses. Certainly, in this lesion, as manifested in the nasal cavity, my own experience goes to show that the administration of twenty grains of iodide of potassium, three times daily, is quite sufficient to accomplish the desired end. I do not say that all cases can be controlled by this amount. The administration of the remedy, however, should be commenced with this dose, given three times daily. If at the end of the second day a notable subsidence in the tumor is not observed, the dose should be increased to thirty or even to forty grains. As a rule, however, the twenty-grain dose will prove sufficient. The amounts above given should be administered in at least a wineglass of water to each dose. Full doses of the iodide are to be continued until every vestige of the gummy deposit has disappeared, and continued in ten-grain doses three times daily for ten days. When the iodides are not tolerated on account of the excessive irritability of the stomach, the drug should be given in a wineglass of milk. If this is not sufficient, it may be given for a short period by the

rectum. The diet should be regulated when the iodides are not tolerated; perhaps the best plan is to restrict as far as possible the use of vegetable food, putting the patients mainly on an albuminous diet and restricting the use of tea and coffee, alcohol and tobacco being entirely interdicted. Or, we may place the patient on a milk diet for a time; the nourishment is administered in thoroughly ample quantities and the stomach is but slightly taxed.

A change of climate sometimes overcomes this intolerance, but frequently intolerance of the iodides resists all our ingenuity. We may, therefore, occasionally intermit the drug and put the patient under a course of general tonic treatment for a week or ten days.

Another serious obstacle occasionally met with in the administration of the iodides is the production of iodism, which I have seen resulting from the administration of even small doses, giving rise to an intense irritation of the mucous membrane of the whole upper air tract as well as of the conjunctivæ. This difficulty, however, is readily overcome in most cases by adding to each dose of the iodide ten grains of the bromide of potassium.

I am disposed to think mercury has but very little effect upon a gummy tumor, and although there is good authority for the doctrine that in this stage of the disease its administration should be combined with that of the iodides, I am disposed to think it had best be avoided until the iodides have fully accomplished their purpose, when, of course, it should be administered after the manner to be described later. There is no local treatment specially indicated in the management of a gummy tumor.

The Deep Ulcer.—The treatment of the deep ulceration demands the thorough cleansing of the part with some simple carbolized wash. After the ulcer is thoroughly cleansed, any necrosed tissue which is found should be removed by means of the snare or a sharp spoon. After this, the ulcer should be filled, by means of the insufflator, with powdered iodoform or with iodol. This procedure should be repeated daily, until healthy action is established in the diseased tissues. At the same time, the patient should be directed to make use, three or four times daily, by means of the nasal douche, or by simple insufflation from the palm of the hand, of a cleansing lotion.

An exceedingly nice way of using a lotion is by means of the hand-ball atomizer shown in Fig. 18. In this stage of the disease, much smaller doses are required than in the primary stage of gummatous infiltration, and I think a larger dose than twenty grains of the iodides is rarely indicated. This should be administered until there is evidence that the disease is well under control, and that such ulcerative action as remains is due only to the existence of necrosed

bone. There is no objection to the commencement of the administration of mercury in this stage of the disease in connection with the iodides, using either the bichloride or biniodide, in doses of one-sixteenth of a grain three times daily.

If the probe reveals the existence of necrosed bone beneath the ulcer it should be removed, for in many cases this undoubtedly keeps up the diseased action. It is important, however, to distinguish between necrosed and exposed bone, for in the latter case the probe often gives indications which may very closely simulate those of necrosis. The impact of the probe upon necrosed bone gives rise to a hard, dry, gritty sensation, which is notably different from that of merely exposed bone, where there is a slight suggestion of softness and moisture in connection with the gritty feeling. If the part is completely necrosed, and a loose sequestrum has formed, it is to be removed by means of a stout pair of forceps. If it is too large for removal, it should be broken up with a proper crushing instrument, or, better still, by the snare.

If the sequestrum has not fully separated itself, I am disposed to think it is well to wait until this has taken place, for separation rapidly follows the necrotic processes. Certainly I do not approve of the burr and dental engine, which have been used so much of late in these cases. I have seen no case of necrosis of the bones of the nasal cavity in which a sufficiently accurate diagnosis of the size and locality of the sequestrum could not be made by means of the eye and the probe to render its removal comparatively simple and without injury to neighboring parts, which is so liable to occur from the use of the burr.

The General or Constitutional Treatment of Syphilis.—After the local lesion has been satisfactorily disposed of, the further indication, and by far the most important one, is to eliminate the syphilitic poison from the system, by a prolonged course of mercurial treatment, the details of which are best found in the standard works on the subject.

CHAPTER XXIV.

CONGENITAL SYPHILIS OF THE NASAL PASSAGES.

Syphilis in the father or mother is exceedingly liable to be followed by syphilis in their offspring. It is a remarkable fact that a woman may bear a syphilitic child who is herself immune and cannot be infected; she has received a sort of protective inoculation, without having had any actual manifestations of the disease. A syphilitic father may beget a healthy child ; on the other hand the child of a man long since considered cured may be syphilitic. The transmissive power under judicious treatment, however, rarely exceeds three or four years. These problems, however interesting, need not be discussed in the present chapter.

With the exception of the primary sore, every feature of the acquired disease may be seen in the congenital form. Speaking generally, when the child is not actually born with symptoms of the disease, it usually from the fourth to the eighth week, rarely later, begins to show them.

The earliest manifestation of congenital syphilis in children is either in a coryza or in some form of cutaneous eruption. In still rarer cases, we have iritis, deafness, or some obscure brain symptoms. I know of no statistics bearing on the frequency of the special lesion, although, unquestionably, in the large majority of cases, the first manifestation of syphilis in children occurs in the form of a coryza, which, manifesting itself by the ordinary symptoms of nasal stenosis with watery discharge, as the disease progresses gradually develops into a muco-purulent discharge of a somewhat acrid character, giving rise to irritation of the muco-cutaneous junction and of the upper lip, together with crust formation about the margins of the nostrils. The essential lesion consists of an inflammation of the mucous membrane lining the nose, apparently a non-specific rhinitis. The diagnosis must depend in part on the clinical history of the case and the concomitant appearances, but mainly on the general appearance of the child, which shows very marked evidence of malnutrition, the skin presenting a pale, somewhat earthy color, while the general facial expression gives to the child a

pinched and old-man face, as it were. In connection with this, in the majority of cases, either concomitant with the development of the nasal symptoms, or soon after, there appears the ordinary eruption on the skin, which verifies the diagnosis. This makes its appearance usually about the anus or buttocks, and afterward spreads over the body. It is usually papular in character, presenting the typical copper color. The further manifestation of the disease in the nose consists in the deposit of gummatous material, either in the superficial or deep layers of the membrane, which, breaking down rapidly, results in an ulcerative process. This phase of the disease is manifested by an increase of the pus discharge, which has now assumed a somewhat offensive character and is mingled with blood and shreds of black necrotic tissue. The secretions from the ulcerative surfaces form hard incrustations, which, drying, by a somewhat rapid process of accretion obtain such size that they cannot be expelled from the cavity, and hence form an additional source of irritation, in that they may give rise to reflex brain disturbances, which may lead to the suspicion of the existence of some form of brain-syphilis.

Congenital syphilis of the nose in young children runs an exceedingly rapid course, the ulceration following rapidly on the coryza, which very soon leads to exposure of bone and subsequent necrosis, as external deformity shows itself very early in the history of the case, evidencing the fact that the whole of the bony septum, and probably some portion of the nasal bones, have been destroyed. In a case reported by Hawkins, nasal syphilis developed in a child six weeks after birth, resulting in complete destruction of the vomer, with sinking in of the nose four months later. We thus find the clinical history of the development of syphilis in children differing from that of adults in a very striking degree. This is not to be explained by the view that inherited syphilis is a more active poison than the acquired form of the disease, but rather by the fact that small children possess a comparatively slight power of resisting the inroads of any disease; hence, the syphilitic virus makes a very powerful impression from the onset upon infants, giving rise to a general impairment of all the nutritive powers, as evidenced by their general cachexia already described, this general cachexia not being necessarily a direct, but an indirect result of the disease.

Diagnosis.—The diagnosis of nasal syphilis ought to be comparatively easy in all cases, in the early stage, when it is characterized by a simple coryza. It should be remembered that the turbinated tissues are in a very early stage of development at birth and for some months later; hence an acute idiopathic rhinitis is an exceedingly

rare disease at this age. Furthermore, if by any chance such a disease exists, it would run the ordinary course of a few days and undergo resolution, whereas in syphilis it progresses rapidly toward the development of a discharge, of such a decidedly purulent character as to eliminate the possibility of its being an acute rhinitis even in its late stages, wherein the discharge never obtains an absolutely purulent character. In a purulent rhinitis in children, in the early stage of atrophy, the disease never develops earlier than from three to four years of age, and in its earlier stages is an exceedingly mild affection, and not characterized by any notable stenosis, or great swelling of the mucous membrane. Hence in a given case of coryza, in the first few months of life, suspicion should always be excited of the existence of inherited disease. If, in addition, the child is small, poorly nourished, and presents the ordinary appearance of anæmia, together with an earthy tint of the skin, and an old-man look in the face, we have still further confirmation of this suspicion. The appearance of the characteristic eruption, however, renders the diagnosis complete, and this should be easily recognized from its gross appearances. Still later developments, as bloody pus mixed with necrotic tissue, in connection with the characteristic fetor which attends an ulcerative process in the nose, of course, leaves no possibility of mistake in diagnosis. Bäumler alludes to the characteristic appearance of the external nose, in these cases, which consists mainly in a depression or flattening of the nasal bridge, together with a protrusion of the frontal sinuses.

In addition to these objective symptoms, much light can be thrown on the matter of diagnosis by making close inquiry as to the possibility of syphilitic disease in either the father or mother. This clinical feature of the disease can usually be investigated very thoroughly, and the facts of the case established with a fair degree of certainty. As a matter of clinical observation, any father or mother who has had a primary syphilitic lesion within three years preceding conception is liable to transmit the disease to the offspring.

Prognosis.—The early development of syphilis in children is to be regarded as an evidence of the activity of the specific virus in the system. Thus, in a case in which the evidences of the disease are presented at birth the prognosis is simply bad, as those cases are rarely amenable to treatment—one of the most serious features of the case being that the nasal disorder so far interferes with nursing as to lead to the very early development of mal-nutrition or marasmus, and the children usually succumb, largely as a result of this complication. On the other hand, we may state it as a rule, that the later the development of the disease, the more favorable the prognosis, in that the child has had an opportunity of gaining vigor and strength to combat

the blood poison when it manifests itself, and, furthermore, I think it may be stated as a rule, that the later the disease manifests itself, the slower its progress, hence the better the opportunity for establishing the diagnosis, and placing the child under proper remedial measures. Briefly the prognosis depends upon the time at which the disease develops, the extent of tissue involved, and lastly, but of most importance, on the general condition of the child.

Treatment.—The local treatment of the coryza is a matter of some importance, if thereby we are enabled to restore the passages to their normal patency, and thus allow the child to take its nourishment in proper amounts from the breast. For this purpose we, perhaps, possess no remedy which is so efficacious as cocaine, which should be used in the form of a spray, in about half-per-cent solution, or, perhaps better still, in the form of an emulsion with some oily substance. Astringents possess no value in this condition. The integument about the margins of the nostrils is always exceedingly tender, and should therefore be protected by the local application of vaseline or cold cream. After the disease has progressed to the ulcerative stage, our efforts are directed entirely toward keeping the parts thoroughly cleansed and applying iodol or iodoform. The difficulty, of course, in cleansing the nose in an infant is that the child cannot blow its own nose. This is fairly well accomplished for the child, by fitting the nozzle of the spray apparatus into the nostril and blowing, the reservoir of the spray being empty; the current of air blown into one nostril escapes with considerable force through the other, carrying with it such mucus or pus as may lie in the cavity.

In any event the child should be brought as rapidly as possible under the influence of mercury. If administration by the mouth is not possible, inunctions should be used—five grains daily of the ointment or two to three grains of the oleate of a twenty-per-cent. strength. The mercurial bath may be used with advantage, eight or ten grains of corrosive sublimate, in four or five gallons of tepid water, into which the child is placed, and allowed to remain from ten to fifteen minutes, care being taken to exclude water from the eyes, mouth, and nose. If ulceration exists in the nasal cavity, or evidence of gummy deposit, it is well to administer small doses of iodide of potassium, for a limited period of time, its duration being governed by the toleration of the child and the impression which the remedy makes upon this special feature of the disease. The dose, however, should not be increased above two grains, given three times daily. It should be given in connection with the biniodide or bichloride. In addition to the constitutional treatment, the general condition of the patient should be zealously looked after.

CHAPTER XXV.

TUBERCULOSIS OF THE NASAL PASSAGES.

Tuberculous disease invades the nasal passages with greater rarity than any other portion of the respiratory tract. Thus Williglk, in four hundred and seventy-six autopsies of tuberculous cases, found but one case in which the nasal membrane was involved, while Weichselbaum found two cases in one hundred and sixty-four autopsies. The first to recognize the disease during life was Laveran, who reported two cases, in which advanced tuberculosis was complicated by a low form of sluggish ulceration upon the septum, which he considered due to a tuberculous deposit. In one of these cases the diagnosis was confirmed by autopsy, while in his second case there was some question whether the disease was genuinely tuberculous in character.

There are in all about twenty cases, on which, I think, our knowledge of the clinical history of the disease must be based.

Etiology.—The disease occurs in connection with either pulmonary or general tuberculosis, exceptions to this rule being two cases of Riedel's in which the diagnosis is doubtful, and a single case of Schäffer's in which no pulmonary disease was recognized. Hereditary influence is shown to exist in a large proportion of cases of the disease. How far the local condition of the nasal cavity may affect the ulcerative process cannot be determined.

Pathology.—A tuberculous process in the nasal mucous membrane manifests itself in two forms. In the one case, it develops in the ordinary tuberculous ulceration, very similar to that observed in other portions of the air tract. In other cases, it shows a tendency to hyperplasia, in the form of small tumors varying in size from bird-shot to a pea, presenting a somewhat mammillated or raspberry-like surface, the growths being attached to the parts beneath by a broad base. The ulceration, in the majority of instances, shows itself on the septum or floor of the nares, while the neoplastic form, on the other hand, is more frequently found on the turbinated bodies, although occasionally found on the septum also. Examination will determine whether the

form be neoplastic or ulcerative. A section of the growth exhibits a fine basment membrane of connective tissue, richly infiltrated with round nucleated cells (lymph cells), together with larger nucleated epithelial or endothelial cells, and sometimes, but not always, true giant cells. The normal gland structure of the membrane is more or less modified, the glands may appear normal, or they may be distorted by the pressure of the surrounding inflammatory products. The gland epithelium may degenerate, or it may simply be pushed off, as it were, by the infiltration of the tissues by the round cells. The tissue immediately about the ulcer or tumor, as the case may be, shows an abundant round-cell infiltration. Under the microscope tubercle bacilli are found, and are usually present in rather small numbers.

Symptomatology.—If the disease takes on the ulcerative form, the prominent symptom will be the discharge of grayish mucus, more or less profuse, according to the extent and size of the ulceration. If the ulceration is on the septum, especially if near the nostril, crust formation will prove a source of annoyance to the patient. In these cases also, slight hemorrhage is liable to attend the dislodgment of the crusts. Pain is rarely present, either subjectively or as the result of pressure. In the neoplastic form of the disease, the prominent symptom attendant upon the presence of these small growths is obstruction with a moderate amount of secretion and occasional hemorrhage.

Diagnosis.—A tuberculous ulcer, wherever it may be, presents a certain characteristic appearance, which distinguishes it from any other form of ulcerative action. Its surface is of a whitish-gray color, flush with the surface of the mucous membrane surrounding it. In other words, there is no apparent loss of tissue. The outline of the ulcer is somewhat irregularly rounded, while the mucous membrane surrounding the ulcer presents no characteristic distinctive features. The secretion from the surface of the ulcer is usually a whitish-gray mucus, mingled with a few epithelial cells, not however in sufficient numbers to render the secretion notably opaque. These peculiar characteristics of this form of ulceration are somewhat changed in the nose, owing to the fact that the impurities of the inspired air tend to irritate the disease process in this region, and furthermore they lodge upon and discolor the ulcerated surfaces. Hence, we notice a slight tendency to bleeding, together with a certain amount of congestion of the blood-vessels.

The hyperplastic form presents, on inspection, small rounded projections from the mucous membrane of the nose; as a rule they are found on one of the turbinated bodies, and are of a reddish-gray tinge and mammillated contour, presenting very much the appearance

of a papillomatous growth, differing, however, from a papilloma, in that they are usually much smaller, more flattened, and of a more regularly rounded contour. A positive diagnosis can only be made from a microscopical examination; the presence of bacilli is an infallible indication of tuberculosis.

Prognosis.—Apparently, tuberculous disease of the nose gives rise to no very marked symptoms, and, furthermore, does not seem to very greatly affect the prognosis of the general or pulmonary disease to which it is secondary. I think, as a rule, that the nearer a tuberculous process involving the air passages approaches to the external world, the more virulent and hopeless the disease seems to be. This is not true of the nasal disease. Tuberculosis shows no marked tendency to extend in the nose, and indeed grows very slowly. As regards its curability, however, the prognosis is unfavorable. Local measures have accomplished little in the way of controlling the disease process. The total extirpation of the disease seems to have arrested it in certain cases, although as a rule, there has been a recurrence.

Treatment.—The indications for treatment locally consist in the use of cleansing and disinfecting washes, together with the local application of iodoform in powder. If pain be present, this should be combined with morphine. The neoplastic form demands extirpation by means of the snare or the curette, as suggested by Schäffer, after which the base is cauterized, either by a chemical agent or the galvanocautery. Hahn recommends curetting or the Paquelin cautery, with application of pyrogallic acid; he cured several cases in this way. That form of treatment which seems to have afforded the best results is the total extirpation of the disease, when this is feasible, as is especially easy of accomplishment when the disease is located in the septum. Cartaz recommends the use of lactic acid after the method suggested by Krause in the treatment of laryngeal phthisis.

CHAPTER XXVI.

LUPUS OF THE NASAL PASSAGES.

Lupus of the nose consists of a deposit in the tissues of the nasal mucous membrane of what is probably a specific virus, which not only produces primarily certain local changes of an inflammatory character, and subsequently ulcerative action, but also leads to the development of new centres of morbid activity in the neighboring tissues, giving rise to what are generally termed lupus nodules. The disease belongs essentially to the skin, and in the majority of instances invasion of the nasal mucous membrane is due to the extension of the disease from the surrounding integument. In rare cases, however, the disease commences in the nasal cavity, and although not in every instance extending to the tissues beyond the muco-cutaneous junction, this tendency is usually clearly manifest. Cases have been reported by various writers, and while many of them are given with insufficient data, and in others the diagnosis is open to serious question, yet many valuable deductions can be drawn from an analysis of those cases in which the diagnosis has been established, and of which full reports have been given.

Etiology.—The origin of the disease is obscure, although it is usually associated with a notably impaired condition of the general health, and in some instances with unmistakable evidences of the strumous diathesis. It is usually said to occur more frequently in females than in males, although, in the above list of cases, about forty per cent of the sufferers were males. It is furthermore stated that it is essentially a disease of youth. This is not the rule, for the average age in the cases reported was thirty-six, the oldest case occurring at the age of fifty-two. In the majority of instances the nasal affection is due to an extension from the external nose; this was found in about forty per cent of those reported, but it should be borne in mind that undoubtedly a very large number of cases occurs in which the skin affection so far overshadows the disease of the nasal cavity that no note is made of the latter, the notable cases being those in which the origin of the disease is the mucous membrane.

Symptomatology.—A moderate amount of nasal stenosis, accord-

ing to the extent of the disease, is always present, this symptom being aggravated by the formation of crusts. The discharge from the surface of the ulcer is of a thin sero-mucous character, and is never large in amount. Odor is rarely present, unless the disease is situated well up in the nasal cavity, and the crusts are retained for a sufficient length of time to undergo decomposition. While pain is not a prominent symptom of lupus of the skin, it may be present when the disease invades the nasal cavity. According to Neisser a very frequent complication of lupus is erysipelas. Clinical observation, however, as regards nasal lupus, would scarcely favor this view.

Pathology.—The pathological changes which take place in the mucous membrane consist essentially of a deposit in the tissues, or their infiltration with small, round corpuscles of granulation tissue, which embed themselves between the bands of connective tissue and the glands, and show a tendency to follow the course of the blood-vessels. The infiltration, instead of occurring in a diffuse form, shows a marked disposition to gather itself into small masses, giving rise to the so-called lupus nodules. An examination of these nodules, in many cases, will show the presence of giant cells. We have here, then, merely a number of independent centres of inflammatory action, which would seem to indicate that the disease is due to the entrance of this specific virus, as stated by Neisser, each point of invasion becoming the seat of a localized inflammatory process. In addition, however, we notice the presence of giant corpuscles. These, as we know, may occur in tuberculosis, syphilis, or scrofula, hence their pathological significance remains still a disputed question. The further changes which take place in the membrane consist either in the reabsorption of the granulation tissue, or its progress toward the surface of the membrane, resulting in a breaking down of tissue there and the establishment of an ulcerative process, which possesses somewhat peculiar features, in that while the waste of tissue from the surface is by no means rapid, the building-up process, as it were, or the proliferation of round cells continues; hence we have an ulcerative process in which, instead of a loss of tissue, there is really an excess of tissue, the contour of the ulcer projecting above the normal surface of the mucous membrane. Schüller has observed small, round bodies or micrococci embedded between the granulation cells and extending in the form of irregular chains of micrococci into the neighboring connective tissues. Neisser, on the other hand, seems to think that Schüller is mistaken, and that the agency which causes the disease will sooner or later be demonstrated to be the tubercle bacillus.

Diagnosis.—In those cases in which the disease is due to an extension of lupus from the external integument, of course the diag-

nosis is simple. When, however, the starting-point is within the nose, as Billroth has pointed out, the gross appearance of the ulcer varies somewhat, and it is not only "pardonable, but even unavoidable" to mistake the disease for a syphilitic lesion. As a rule, our attention is called to the disease only after the ulcerative process becomes established. At this time, inspection will reveal a granular mass, projecting above the surface, of a reddish or brownish color, and covered by a brownish-gray crust, the removal of which shows the ulcer beneath, covered with grayish or whitish tenacious mucus. Upon the impact of the probe, the tissue is exceedingly soft, and the instrument penetrates readily, without exciting much pain or hemorrhage. If the disease is located upon the septum, the probe will readily penetrate through the cartilage, or, if this has been destroyed, it passes completely through to the opposite cavity, showing the mass to be of a soft, pulpy, and easily yielding consistency. A positive diagnosis, however, cannot be based simply on the gross appearance of the mass. The essentially chronic character of the disease, and the fact that it does not yield to antisyphilitic treatment, add much to our information, while the positive differential diagnosis between lupus, sarcoma, carcinoma, and tuberculosis, the only other diseases with which it may be confounded, must be based on the microscopic characters of the tissue.

Course and Prognosis.—Lupus of the nasal mucous membrane would seem to be a much less serious affection, and more amenable to treatment, than lupus of the skin, if we are to accept the cases reported. While it runs an essentially chronic course, the destruction of tissue is by no means so rapid, and furthermore, its progress can be promptly arrested. Why this should be, it is difficult to state, unless it is that the reparative force in a mucous membrane is more active than in the skin, as shown by the fact that, whereas any extensive destruction of the skin is followed by a slow process of healing, and furthermore a cicatrix is likely to be very intractable, as in the case of a burn, in a mucous membrane, on the other hand, a cicatrix is a very great rarity, if it ever occurs, and even extensive destruction of tissue is followed by complete restoration of the part to its normal condition. Whatever the cause may be, the fact certainly exists, that unless the disease has invaded too large an amount of tissue a cure may be expected. The duration of the disease would seem to have some influence. The age of the patient does not seem to affect the prognosis.

Treatment.—It should be borne in mind that the disease extends both by the piling-up of an original lupus nodule, and also by the development of new centres in the surrounding tissues, this process,

however, being extremely slow. The probabilities are that the virus which produces the original disease reproduces itself, and that its progress is due exclusively to a reinoculation. Hence it becomes important in dealing with the disease that every possible seat of infection should be thoroughly eradicated. Excision, however, is not usually demanded, as all that is necessary can be accomplished by either scraping or scarification, as recommended by Volkmann, or by the use of some caustic agent. For this latter purpose, Bresgen made use of chromic acid, but found it not so efficient as the potential cautery, while Rafin used an eighty-per-cent. solution of lactic acid. Each individual case, however, will afford ample opportunities of testing the efficacy of any caustic used, and since there seems to be no danger of stimulating a renewed activity in the growth by these agents, they may be pushed to the full extent. Certainly, in most cases, Volkmann's spoon will be the first resort, as the tissue is of a soft and grumous character, and there is no danger of encroaching upon healthy parts. As before stated, the disease is accompanied by a notable impairment of the general health, and hence it scarce needs be added that the indications for general tonic remedies are always present. Hunt seems to regard arsenic as a specific, although this observation lacks clinical support.

CHAPTER XXVII.

RHINO-SCLEROMA.

It is the almost invariable rule, that a disease process in the mucous membrane shows no tendency to pass over the muco-cutaneous junction and involve the integument. An exception to this rule, however, is found in that very curious disease, first described by Hebra, to which he gave the name rhino-scleroma, and which consists essentially in the development in the deeper layer of the mucous membrane or integment of hard, dense plates with somewhat rounded edges, which make their appearance either in the mucous membrane within the nostril, or in the integument of the alæ or upper lip, the starting-point usually being not far from the margin of the nostril. After inception the disease extends by a slow but irresistible progress, either by the enlargement of the original plates, or by new centres of development.

Etiology.—Our clinical knowledge of the disease fails to throw any light whatever on the cause of the affection; it apparently develops upon patients in perfect health, and usually at a time of life when the vital powers are at their best, as most of the cases occurred before the age of forty. In one case it occurred in a boy aged fourteen. Mackenzie suggests that the climate or conditions of life in south-eastern Europe may have some influence as a predisposing cause of the affection, which would seem to carry the suggestion that it bears a certain analogy to goitre in Switzerland and to leprosy in the Orient; and yet I think the fact of so many cases being reported as occurring in the neighborhood of Vienna is to be explained on the ground of the great activity of the study of skin diseases so characteristic of that city, and the interest excited by Hebra's original paper, inasmuch as later reports indicate that it is met with in most distant parts of the globe, as San Salvador, Guatemala, and Egypt. The possibility of the syphilitic origin of the disease is very thoroughly excluded by the large number of reported cases, in which antisyphilitic treatment proved absolutely of no avail.

Symptomatology.—Subjectively, the disease gives rise to no notable symptoms, in that its slow progress is attended with no local disturbances. There is usually some tenderness on pressure, but

aside from this no pain attends its development. If, however, the growth encroaches upon the respiratory tract so far as to interfere with respiration, of course considerable discomfort arises from this cause. Or again, when it extends backward toward the fauces, or possibly into the larynx, laryngeal stenosis becomes an exceedingly grave condition. Again, if the disease encroaches upon the oral cavity, it may be a source of infinite distress, as in one of Mickulicz' cases the oral orifice was so nearly obliterated that an external operation became necessary, while in another of Mickulicz' cases the soft palate became adherent to the wall of the pharynx, necessitating an operation in this region to relieve the difficulty. Aside from these extreme conditions, the prominent symptoms to which the disease gives rise consist mainly in a certain degree of deformity, together with a feeling of stiffness and general discomfort about the integument. The progress of the disease is characterized essentially by infiltration of tissue, and no other morbid process is superadded. There is no tendency whatever to a breaking down, or to the formation of an ulcerative process.

Pathology.—According to the original observation of Hebra, the essential pathological lesion which constitutes the disease consists of an infiltration of the chorium or papillæ of the skin, or, when it occurs in mucous membranes, an infiltration of the deep layer of the mucous membrane with small-round cells. As the result of this infiltration, the normal structures of the tissue are so far encroached upon as to give rise to an atrophic process, simply as the result of pressure involving the gland structures, the connective tissue, and, in fact, all the normal elements of the membrane and integument. This would seem to indicate that the morbid process is inflammatory in character, a view entertained by Mickulicz, although from a clinical standpoint there are no evidences whatever of an inflammatory process. Still further changes are observed by Mickulicz, which consist in a transformation of the round cells into spindle cells, and finally into a dense fibrous connective tissue. Tanturri makes the statement that the disease is essentially epithelial in character, and yet this view is probably based on an examination of a very superficial portion of the tissue removed, as he is entirely unsupported. Cornil finds a small, rod-like bacillus inclosed in a hyaline capsule, closely resembling Friedländer's pneumococcus, from which he draws the conclusion that the disease is parasitic in its nature, although Dietrich, accepting the view that the disease may perhaps be due to a microbe, whether Cornil's or some other, yet asserts that it results more probably from a mixed infection than from a specific germ, and that the existence of the microbe is entirely adventitious, and not essential to the disease.

Frisch finds a small rod-shaped bacillus in the round cells, especially in those which have undergone retrograde metamorphosis. He believes that the connective tissue is the result of inflammation set up by the bacteria.

It is interesting to note that the disease has been reproduced in animals, from cultures of the bacilli by Stepanow. The special changes which take place in the tissues are shown in Fig. 42.

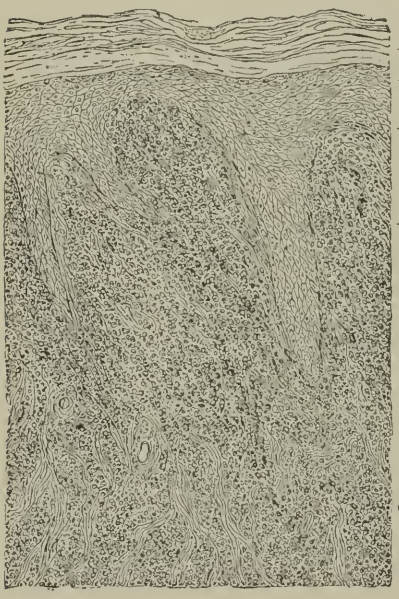

FIG. 42.—Rhino-scleroma. *E*, Thickened epidermis; *L*, broadened stratum lucidum; *R*, rete mucosum; *P*, papillary layer; *C*, tracts of dense fibrous connective tissue; *I*, *I*, small cellular infiltration of derma.

DIAGNOSIS.—The disease makes its appearance in small, rounded, flattened nodules, which may project beyond the skin, giving rise to slight tumefaction, or it may be entirely beneath the skin or mucous membrane, without marring its normal contour. The tissue covering it may be of a healthy color, although ordinarily it is of a dusky-red tinge. These nodules may occur in considerable numbers, entirely separated from one another, or they may be contiguous. They develop by an exceedingly slow progress of growth, both in size and superficial area, extending to neighboring tissues. The extension of the growth is usually lateral, although it may pile itself up into irregular masses. It is hard to the touch, usually tender, but does not give rise to any pain. The tissue surrounding the growth presents an absolutely normal appearance, there being no areola of redness, or indeed any vascular engorgement, unless, as occasionally occurs, the tissue over the surface of the tumor is slightly reddened. There is never any œdema, or swelling of the tissues beyond the growth. The growth itself presents to the touch a hard, dense, cartilaginous feeling, or even, in advanced cases, it gives the impression of bone. The only affections with which it might be confounded are sarcoma, carcinoma, and syphilis. The characteristic appearance of malignant disease is a soft grumous mass, bleeding readily on touch, in connection with an acrid discharge, which in all cases makes the diagnosis clear. The only manifestation of syphilis with which it might be confounded in the nasal cavity is a gummy

tumor, whose smooth outline differs essentially from the nodular character of rhino-scleroma, while the latter presents a characteristic stony feeling, never met with in the syphilitic manifestation. Any doubt in the diagnosis is, of course, quickly dispelled by the administration of antisyphilitic treatment.

Prognosis.—The disease is essentially intractable, and is usually regarded as absolutely incurable. With the exception of a case of Doutrelepont's alone, no remedies or therapeutic measures have ever been resorted to, which seemed to have the slightest effect in controlling its progress.

As regards life, however, the prognosis is favorable, as the disease is purely a local one, for its onset does not necessarily impair the general health, and involves no tendency to death, except when it interferes with important functions by its mere location, as for instance when it extends to the larynx, giving rise to stenosis and threatened suffocation. With this exception, the disease apparently does not shorten life, and simply continues a source of discomfort to the victim until death occurs, usually from intercurrent disease. Thus, in a case of Schulthess', the disease had extended so far at the end of twenty-four years as to involve the integument of the external nose, upper lip, the upper and lower pharynx and the larynx, giving rise to stenosis of the larynx, demanding tracheotomy, the patient being still living at the time of the report. This would appear to be the limit to which the disease ever extends. When having its origin in or near the nostril, it extends to the external nose, upper lip, and in rare cases encircles the mouth. After entering the nasal cavity, it travels slowly backward, involving the pharynx, soft palate, and larynx, after which its lateral extension seems to cease, while its remaining energy is expended in adding to the already existing tumefaction.

Ganghofner, however, believes that the disease may sometimes originate and develop in the larynx and trachea, giving rise to stenosis, without the nose and mouth being affected.

Treatment.—A case of Schlapoberski's was cured by treatment after Boeck's method, to wit: the growth was curretted, nitrate of silver applied, and the wound painted with a ten-per-cent solution of iodoform collodion. The treatment lasted seven months. There was a complete cure and no return after four and a half years. Tschernogubow had excellent results from the galvano-cautery, and Fedorow, with subcutaneous injections of a ten-per-cent solution of chloride of zinc. Mourék used with some slight success injections of from two to sixty millimetres of nuclein. He gave from seven to twenty-nine injections. Sturowenrow used injections of arsenic from 1 : 100 to 12 : 100; he recommends the treatment, as he had good results.

CHAPTER XXVIII.

NASAL POLYPUS, OR MYXOMA.

This term nasal polypus is given to a variety of growths met with in the nasal cavity more frequently than any other form of neoplasm. They occur either singly or in groups, and present a grayish, semi-opaque appearance. They have been recognized by medical writers from the earliest times and occur more frequently than is generally recognized. My own experience shows that of one thousand four hundred and eighteen cases of ordinary catarrhal disease seen in private practice, exclusive of my hospital cases, one hundred and thirty-four showed the presence of fully developed polypi, or about one case of polypus for every eleven cases of ordinary catarrhal trouble.

Pathology.—The prevailing type of these tumors is that of pure myxoma. According to pathologists, the external surface of the tumor is covered by the epithelial layer of the mucous membrane lining the nasal passages, the epithelium frequently being ciliated. Within this envelope is a delicate reticulum of connective tissue in which are embedded stellate myxomatous and embryonic connective-tissue cells; the bulk of the tumor being made up of a gelatinous intercellular substance containing very largely of mucin.

Cystoma, as will be seen when we come to the discussion of that form of tumor, is met with very rarely in the nasal cavity, but cystic metamorphosis is not an infrequent occurrence in nasal polypi. This would seem, therefore, to go far toward demonstrating that glandular structure is present in the myxomata; acording to Robin, cystic degeneration is due to a general hypertophy of the acinus, together with an atrophy of its duct, as the result of which there is an increased secretion, which, failing of free exit, collects in the gland, whose walls gradually yield to the pressure and become dilated. That this process is not constant, however, has been shown by Billroth, who states that cystic degeneration does not necessarily depend always upon obstruction of the gland duct, but may result from certain changes in the epithelial cells lining the glands, their ducts remaining patent.

Attachment.—All authorities unite in the statement that these

growths spring, as a rule, from the mucous membrane covering the middle turbinated bone. Zuckerkandl made an exhaustive study of the location of these growths, in thirty-three cases which he examined *post mortem*.

In thirty of his cases they had their origin upon or in the immediate neighborhood of the middle turbinated bone, the other three cases springing from the septum.

Etiology.—It is difficult to assign any definite cause for the occurrence of mucous polpyi. They are certainly not due to any impairment of general health or constitutional diathesis, for, as a rule, they occur in patients in vigorous health.

I am disposed to think that the most rational explanation of the development of these growths is that the mucous membrane covering the middle turbinated bone is of very soft and delicate consistency, and is actively concerned in the respiratory function of the nose, viz., serous exosmosis, and that under certain conditions the membrane becomes saturated or water-soaked, as it were, in such a manner as to lead to the development of this peculiar myxomatous condition. As to what peculiar nutritive disturbance in the meshes of this tissue predisposes to this form of degeneration, I have no suggestion to make. The view is based entirely on the fact of the frequent development of nasal polypi in those curious cases of profuse watery discharge from the nasal mucous membrane, already described in the chapter on Nasal Hydrorrhœa, which occurs, not as the result of the impact of vegetable spores upon the nasal mucous membrane, as in hay fever, but is perennial and diurnal; that is, it occurs usually at certain hours every day, through the whole year. In the early stages of the attacks, no morbid conditions of the mucous membrane can be discovered, as a rule, but in a number of instances which have come under my observation, after the disease has persisted for a certain length of time, typical mucous polypi have developed on the membrane covering the lower border of the middle turbinated bone, which, after development, subject as they are to the action of gravitation, together with the traction influence of blowing the nose, and the to-and-fro movement of the current of air in respiration, gradually sag down as it were, and, becoming filled with serum, drag on their original attachment to the membrane above, until a pedunculated tumor is developed (see Fig. 43). A somewhat similar view is suggested by Hopmann, who thinks the primary lesion which leads to the development of the growths is in some impairment of circulation in the efferent vessels, resulting in an œdematous condition of the membrane. Billroth, whose views as to the glandular character of these growths is adopted by Zuckerkandl, considers that

the tumor originates as an adenoma, but later some of the ducts become occluded, resulting in a myxomatous degeneration of the glandular tissue. These growths have been observed to develop after fracture of the vomer. They frequently accompany syphilitic necrosis either of the vomer or of the turbinated bones.

They are more common in males than in females. As to age, they occur most frequently between twenty and thirty, and rarely before the age of fifteen. Lennox Browne is undoubtedly justified in making the broad statement that "polypi may occur at almost any age."

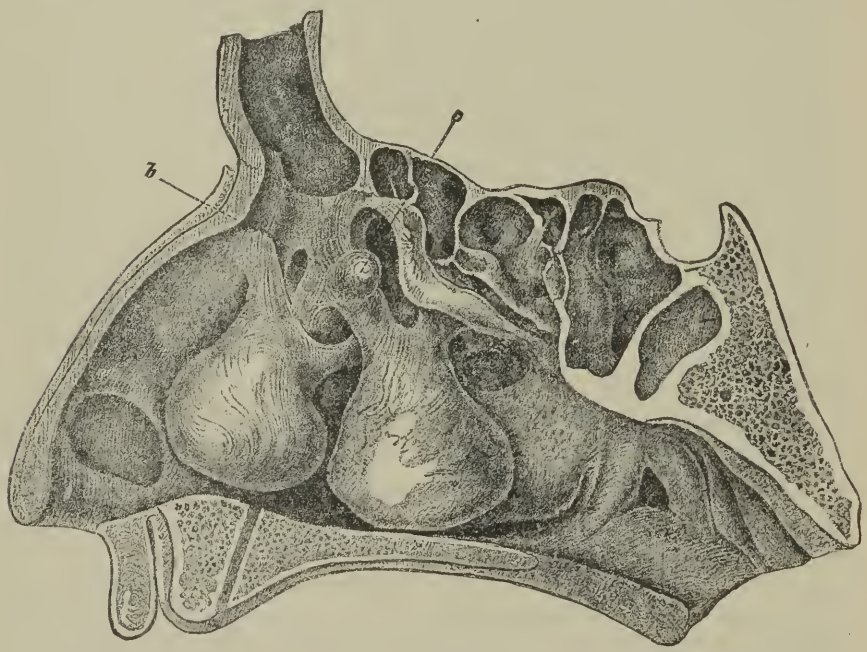

FIG. 43.—Nasal Polypi. (Zuckerkandl.) *b*, Infundibulum; *c*, cyst of the mucous membrane.

Heredity has little if any influence on the development of these tumors.

A deformed septum is not infrequently associated with the existence of nasal polypi, and probably predisposes to their development, in the same manner as to the development of hypertrophic rhinitis. In these cases the tumors are usually found in the more roomy cavity, though in rarer cases in the obstructed side.

SYMPTOMATOLOGY.—The first and earliest symptom that occurs in connection with these growths is intense irritation in the upper passages of the cavity, and more or less violent attacks of sneezing, accompanied with watery discharge. These watery discharges have their source in the mucous membrane proper, and not in the polypus,

as is often asserted. This symptom is due probably to a paresis of the vasomotor control of the respiratory exosmosis. The fluid, making its way through the membrane, produces an abnormal irritation of the parts, causing burning or itching sensations, referable to the bridge of the nose. As the growth develops in size, nasal stenosis sets in, which is at first most marked in the upper portion of the cavity, a form of stenosis which is oftentimes distressing in the nervous irritability which it causes. The stenosis in this region is due more to the swelling of the membrane than to the polypi themselves. As they increase in size, however, they gradually obstruct the entire nose. They commence, as a rule, in one fossa, but I think it is the rare exception that they do not develop sooner or later on the other side.

Loss of the sense of smell occurs early in the development of the disease, not entirely as the result of obstruction, but rather from a certain disorganization which occurs in the mucous membrane lining the olfactory region. The stenosis varies notably under atmospheric conditions, which has given rise to the assertion by probably a majority of writers that these growths possess a certain hygroscopic character; that they absorb moisture and become swollen on damp days. I do not think a myxomatous growth possesses the power of absorbing moisture, and I attribute this symptom to the swelling of the mucous membrane lining the nose, owing to the excessive irritability caused by the presence of the growths. As a consequence, these patients become exceedingly susceptible to changes in the weather, all the symptoms being notably aggravated during the cold and damp days of spring and fall, while the milder seasons afford notable relief. The discharge from the nose is usually rather profuse, and while the disease is confined to the nasal cavity proper, is of a thin, watery character.

In cases of long standing there is frequently a profuse discharge of bright-yellow fluid pus. I doubt very much if a mucous polyp whose source is in the nasal cavity proper ever gives rise to a purulent discharge, and a discharge of this kind should always be understood as indicating the supervention of purulent disease of the antrum or of one of the accessory cavities. The method of development of this complication is quite simple. The orifices of these cavities having become occluded by the presence of the growths, the normal secretion accumulates to such an extent that a purulent inflammation is the natural result. Occasionally a mucous polyp may develop in the antrum, or possibly it may make its way into the antrum from the nose.

As already stated in the discussion on nasal reflexes, no morbid

lesion of the nasal cavities is more frequently the source of reflex disturbances than nasal polypus; hence, asthma and hay fever are associated with these growths in a large proportion of cases, although Hack considers polypi as rather an infrequent intranasal condition, in cases of this disease. This question, however, is more properly discussed elsewhere. For the same reason, ocular symptoms not infrequently occur in connection with the presence of these growths. The aural symptoms due to nasal polypi are to be regarded not as reflexes, but as direct symptoms due to stenosis with interference of normal respiration, their method of development being identical with that described in the chapter on hypertrophic rhinitis.

Suppurative otitis I have not seen, although this complication has been observed by Barth. Tinnitus aurium also is mentioned by Robinson as a complicating symptom. Laryngitis and bronchitis are very liable to occur sooner or later, as the result of the nasal stenosis. The voice is affected according to the extent of the nasal obstruction. To one familiar with these cases, I think the voice presents characteristics which enable us to recognize a case of nasal polypus almost immediately on hearing the voice. The facial expression is also characteristic, in that there is that peculiar thickness about the bridge of the nose which always suggests nasal stenosis, whether from a cold in the head or other causes. Deformity of the external nose is never present in a pure myxoma, the growths as they fill the cavity oozing out, as it were, from one or the other nostril, rather than pressing against the lateral walls.

Diagnosis.—The recognition of a nasal polypus depends entirely on ocular inspection, which should always be made with sunlight or an equally powerful illuminator. As an aid to diagnosis, we should always make use of cocaine, to contract the blood-vessels and open up the cavity for thorough inspection. If a polypus is present it will be seen to present a striking contrast in color with the normal nasal mucous membrane of the passage, while it also presents a tumefaction not belonging to the normal contour of the cavity. The color, furthermore, of a polypus resembles that of no other growth or abnormality found in the nasal cavity. It is of a bluish-gray color, with a bright, shining, glistening surface, not unlike, as before suggested, the pulp of a grape, but with the addition of a bluish rather than a greenish tint.

If the growth has developed so far as to protrude below the middle turbinated bone, we have an additional aid to diagnosis, in the fact that it becomes freely movable in the cavity; hence, in these cases a probe should always be used, to test this mobility. Furthermore, on the impact of a probe it is easily indented, showing a certain re-

siliency by which the indentation disappears readily on the removal of the probe. A mistake in diagnosis I think need never occur with a proper illuminating apparatus. A deflection of the septum presenting near the nostril might be mistaken by the inexperienced for a nasal polyp. Its density and immobility are always sufficiently evident to render such a mistake unnecessary. The same may be said of ecchondromata and exostoses. Abscess of the septum may very closely simulate a mucous polyp, but this affection presents a soft, fluctuating tumor, whose character can easily be ascertained by careful manipulation of the probe, or, better still, by puncture with a bistoury.

Prognosis.—The existence of nasal polypi involves no serious danger to life, though they may give rise to bronchitis, asthma, hay fever, etc. If not treated they develop with rapidity, as the polyp-breeding surface increases in area and the nasal cavities become completely stenosed. There is no tendency to a spontaneous cure, hence the prognosis is mainly dependent upon the success of treatment. A question of perhaps more interest is, whether a myxomatous tumor preserves its original type, or whether it may undergo changes of a malignant character. Billroth says that this idea has been accepted as an article of faith, rather than proven. In this same work, however, he cites a case in which the polyp was at first mucous, and after operation apparently took on a carcinomatous degeneration. In a subsequent work, however, he goes so far as to state that the tissue found in nasal polypi is frequently adeno-sarcomatous. A review of the cases reported gives undoubted evidence that these tumors may undergo not only sarcomatous but probably carcinomatous degeneration, as the result of operative interference. So far as I know, there is no well-established case in literature of nasal polypus having undergone malignant degeneration spontaneously.

Treatment.—The successful treatment of mucous polypi in the nose depends upon their complete ablation, either by destruction or by extirpation.

Certain chemical agents are recommended to be introduced directly into the mass, by means of a hypodermic syringe, or by simple puncture. Thus, Frank Donaldson advises that chromic acid be carried directly into the body of the tumor by means of a pointed glass rod, while Bell accomplished the same purpose by injecting into each growth, by means of a hypodermic syringe, a solution of tannic acid, twenty grains to the ounce. In the same manner Maxwell has had success by the injection of tincture of iron. The destruction of a polyp *in situ* after these methods may undoubtedly be successful, but it results in a necrotic mass of tissue, which remains in the

cavity, a putrid, offensive body, until it sloughs away. In those cases in which twenty, thirty, or even more separate growths occur, this method would involve an unnecessarily long and distressing course of treatment. I think it offers no advantage whatever, sufficient to warrant our subjecting patients to it. The only successful method of dealing with these growths is to extirpate them by surgical means. The evulsion of nasal polypi by means of forceps is the oldest and the one which has come into widest use, but I believe this to be a procedure which should never under any circumstances be resorted to. As regards special directions for searching for the polypus, and for seizing its pedicle, I am confident that no operator ever possessed either the skill to differentiate, by touch with the forceps, a nasal polypus from the mucous membrane, or sufficient manual dexterity to enable him to seize the pedicle. The instrument, at its best, cannot be sufficiently delicate to allow large freedom of action in the nose. As a rule, it will be carried in with its blades open, and then

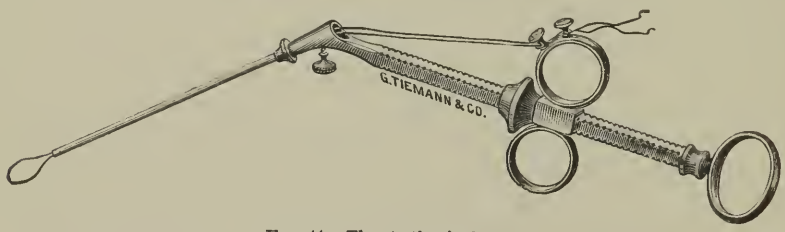

Fig. 44.—The Author's Snare.

be closed upon whatever may happen to fall within its grasp. The essential feature of any operation for the extirpation of nasal polypi is that they shall be removed without injury to the healthy tissues. For the accomplishment of this purpose no measure is comparable to the cold wire snare. In this instrument the loop of steel wire is slipped over the polypus, carried as far toward its base as possible, and then drawn within the tube and the growth severed. The steel wire gives us a loop of sufficient stiffness to enable us to carry it to any portion of the nasal cavity, and over any growth which it is desired to seize. Jarvis' original snare écraseur (see Fig. 31), being somewhat slow in its action, led me to advise the instrument shown in Fig. 44, the manipulation of which will be readily appreciated at a single glance. The loop, being placed in postion over a growth, is drawn home by a single motion, and the tumor severed from its attachments.

The galvano-cautery has had many advocates for its use in the removal of these tumors. By this agent, a growth may be directly destroyed or its attachments severed by the galvano-caustic loop.

Of late years I think this device finds little if any indorsement, those who use the chemical cautery contenting themselves with making use of it to cauterize the base of a growth, after its removal by other methods. The difficulty of putting the soft and pliable platinum wire around the polypus, and the unwieldy nature of the cautery handle as well as the uncleanliness attending the use of the thermo-cautery, and the inflammatory reaction following the operation, combine to make this procedure less desirable than the employment of the cold wire snare. The cold wire snare affords the most efficient and least painful method of operating, and also more completely avoids any dangers or complications that may arise than any other device. The instrument already figured as the author's possesses the advantage of delicacy of construction and ease of manipulation, while, at the same time, it affords an unobstructed view of the manipulation of the loop in the nasal cavity. The still further advantage I think should be mentioned of the three-fingered manipulation, which undoubtedly affords the nicest adjustment of the loop over the growth, and the quickest abscission of the tumor, for it is properly a cutting instrument rather than a snare.

Operation.—In operating on nasal polypi, the use of cocaine is indispensable, both as producing local anæsthesia, and so far contracting the blood-vessels of the mucous membrane as to largely eliminate the possibility of hemorrhage. For this purpose, a twenty-per-cent solution should be used as producing most rapid and complete insensibility. This should be applied by means of an atomizer. In cases in which the cavities are more or less completely filled with the growths, the thorough anæsthetization of the membrane is impossible, although in those cases much can be accomplished by the delicate manipulation of a pledget of cotton on a probe, dipped in the solution and carried in as far as possible. When a mucous polyp is visible, I think it in all cases feasible to carry a loop over it. Now, it is not a matter of importance whether the whole polyp is extirpated at the first operation or not. Bearing in mind that, as a rule, its attachment is beneath the middle turbinated bone, the loop is carried in between the growth and the septum, its lower border being below the lower end of the tumor, when it should be turned to a horizontal plane and by a gentle to-and-fro motion slipped upward, until as much of the polyp as possible is engaged within its lumen, when the loop should be drawn home. Proceeding in this manner, I think in the majority of instances it will be found an easy matter to clear one or both cavities of all presenting growths at a single sitting, provided there are no obstructing deformities of the cavities, such as a deflected septum. Hemorrhage rarely if ever attends this method of

operating in the hands of a skilful manipulator, and therefore need not complicate the procedure, for the blood supply in the polypus itself is exceedingly scanty, and the mucous membrane, the usual source of bleeding, need not be injured. As the operation proceeds, and deeper portions of the cavity are opened up, it is well to repeat the applications of cocaine, as of course much discomfort is saved the patient in anæsthetizing the free portion of the cavity, even if the anæsthetic does not reach completely the part filled by the growth. When the tumor lies well back in the passage, and cannot be easily reached by the snare, although visible, the manipulation will be much aided by the use of McKay's slender ear forceps, shown in Fig. 45.

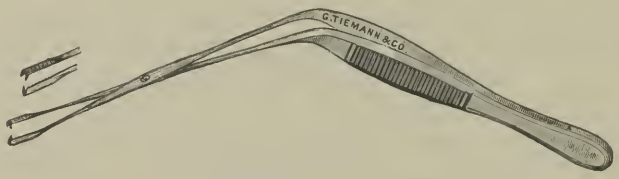

FIG. 45.—McKay's Forceps.

By this instrument the growth can be easily seized, its bite being mouse-toothed, and drawn down into full view, when the loop can be readily adjusted over it. The removal of these growths, however, seems to loosen, as it were, those tumors which have been apparently crowded up in the sinuosities beneath the middle turbinated bone, so that they are enabled to drop down into the cavity. Hence, it is best to repeat the sitting at the end of a week, when oftentimes quite a number of apparently new growths will have shown themselves. These are not new polyps, however, but have simply allowed themseles to come into sight, and moreover have undoubtedly filled up and enlarged simply from the fact that space has been afforded them. The weekly sittings should be continued until an inspection shows a cavity entirely free from polypi, after which the patient should be seen once a month for probably four or five months, at the end of which time a radical cure in the large majority of cases can be assured. A certain amount of importance is attached by some to the cauterization of the base of the growth, to prevent its recurrence, giving preference for this purpose to the galvano-cautery. I have never been able to recognize the base from which a polyp has been severed, and therefore think it unwise to subject healthy tissues to injury, in the blind attempt to cauterize a region that cannot be seen. Furthermore, I do not believe it is necessary, for, as before intimated, if we thoroughly extirpate the growths, they do not recur. The assertion

that in a recurrence of these growths they take on a new development from the fact of their being more dense and consisting largely of connective tissue, has already been referred to. I have in no single instance observed any such tendency, after operating with the cold snare, the polypus at the end of four years showing the same type as the original virgin growth, and I am confident that this fibrous development is entirely the result of traumatism in the use of forceps or the galvanocautery. I make this assertion broadly, for it is based on a large experience in which no single exception to the rule has been observed.

CHAPTER XXIX.

FIBROMA OF THE NASAL PASSAGES.

A CURSORY examination of the literature of nasal growths would seem to suggest that a fibrous tumor in the nasal cavity is an exceedingly rare event. Thus, Mackenzie's study of the subject is based on an analysis of three cases, one of which occurred in his own practice. A more careful investigation, however, shows us that whereas this form of neoplasm is met with more frequently in the naso-pharynx than in any other portion of the upper air passages, its location in the nasal cavity proper is by no means an uncommon occurrence. Moreover, the establishment of this fact is not in any way due to the development of an interest in diseases of the upper air passages, because a majority of the cases found in literature were reported long before the diseases of the nasal cavity became the subject of that industrious investigation which characterizes the present day.

ETIOLOGY.—Morbid processes in the nasal mucous membrane are essentially those which involve connective-tissue changes; hence the highly vascular character of the pituitary membrane, together with the intense functional activity which belongs to it, would seem to provide especially favorable conditions for the development of fibromata. It is a well-known fact that the uterus is the most frequent site of fibroid development, which Billroth very ingeniously explains on the theory that fibromata arise from the nerve sheaths and the adventitia of the small arteries, the nerves disappearing, while the arteries remain, and hence the uterus, whose nerves and vessels undergo such great changes during menstruation and preganancy, offers a favorable site for this form of morbid growth. The daily and hourly changes in the turgescence of the blood-vessels of the nasal membrane, together with its excedingly rich nerve distribution, would seem to show the existence of a certain predisposing cause of the disease under consideration in this region also. The immediate exciting cause, however, is not so easily explained, although in one case, an inflammatory process seems to have been the active cause of the morbid growth, while in another the development seems to have

been due to traumatism. In the negro races, as we know, fibroma of the uterus is exceedingly common. As regards the nasal cavity, however, race would seem to have no influence. Sex, on the other hand, would seem to have a notable influence in predisposing to the disease, in that rather more than two-thirds of the cases reported occurred in males. Age would seem to exercise a certain influence also, in that the disease belongs to the earlier periods of life, usually from fifteen to thirty.

Symptomatology.—As already noted, the disease probably commences in the nerve sheaths and blood-vessels, the nerves being destroyed, while the vessels remain. Hence pain is rarely a symptom in the early part of the disease, although it may develop later, as the result of pressure. Epistaxis, on the other hand, is perhaps one of the most constant and frequent evidences of the disease, due in most instances, undoubtedly, to the vascularity of the growth itself. In the large majority of instances, the source of the bleeding is in the tumor itself. This symptom recurs with considerable frequency, and may become an exceedingly grave symptom. Nasal stenosis, with a more or less profuse muco-purulent discharge mixed with blood or clots, is of course a frequent attendant upon the development of these growths. Perhaps no form of neoplasm develops and spreads with a more unrelenting progress than a fibroma; neither tissue, cartilage, nor bone seems to offer the slightest hindrance to its growth. Hence, according to its original location and the direction of its growth, external deformity usually develops. Headache seems to have been present in a number of these cases, probably of a neuralgic character. Anosmia occurs in the majority of instances, as the direct result of stenosis, while, as its indirect result, slight impairment of hearing is present in all cases, and in many this symptom is very prominent, due probably to the interference with normal nasal respiration, although, if the growth extends into the naso-pharynx, there may be direct pressure upon the oriface of the Eustachian tube, while, as the result of this extension, the movements of the pharynx in deglutition may be seriously interfered with.

Pathology.—Fibroma of the nose, from a pathological point of view, differs in none of its essential features from the same form of neoplasm as found in other regions of the body. It is composed of a dense network of fibrous tissue, containing within the meshes or interspaces, scattered here and there, either between the bundles of fibres or between individual fibres, spindle-shaped or stellate cells, together with a finely granular homogeneous basement substance. The density of the tumor varies to a certain extent, dependent somewhat on the relative proportion of the cellular substance, and the

fibrous tissue. The starting-point of the growth is in the nerve sheaths and adventitia of the small arteries.

Sarcomatous degeneration is a not infrequent occurrence in these cases, and yet the presence of spindle cells is not always to be regarded as an evidence of this change, for this element may persist for a long time, and even increase, and yet the growth itself, from a clinical point of view, show no evidence whatever of malignancy. Thus, Ingals operated on a pure fibroma, which recurred at the end of five years. The tissue removed by the second operation proved to be in part composed of from one-fifth to one-half cellular elements.

In making a microscopic examination, it is a matter of some importance that a number of specimens be studied, in order to establish the definite relation between the fibrous and the cellular elements, as these growths may not only undergo sarcomatous degeneration, but there may be a mixed growth from the onset. Aside from sarcoma, we have fibrous tissue combined with other elements, giving rise to a myxo-fibroma, adeno-fibroma, chondro-fibroma, and osteo-fibroma. Of these forms, myxo-fibroma is not infrequently met with in the nose. Probably, in most cases, this growth is the result of harsh surgical measures for the relief of simple myxoma. A case of Dixon's, so far as I know, is the only instance on record of a chondro-fibroma. Of the other varieties, no cases have been reported as occurring in the nasal cavity.

Diagnosis.—With our present means of exploring the nasal passages, by depleting the blood-vessels through the action of cocaine, a fibroma whose origin is in the nasal cavity proper should ordinarily be brought under ocular inspection through the anterior nares, even when situated well back in the chambers, if the secretions be deftly removed, by means of a cotton pledget, and the parts thoroughly cleansed. If this is not feasible, it can be brought under inspection by means of a rhinoscopic mirror in the fauces. When seen, its gross appearance is characteristic and usually recognized with facility. The surface of the growth is irregularly rounded or lobulated, smooth and glistening in appearance, and presents a decidedly reddish-pink color. The growth is of a dense, resisting character, and need not usually be mistaken for any other neoplasm, the diagnosis being based on the subjective symptoms of stenosis, and much aided by external deformity, when it exists, together with the repeated attacks of epistaxis, which are characteristic, and the peculiar color and gross appearance.

While the diagnosis of the character of the growth is quite easy, the determination of its origin requires a more careful examination. It is a matter of no little importance to determine whether the growth

springs from the nasal cavity proper, or from the vault of the pharynx, for, as we have seen, nasal fibromata are comparatively rare, while the upper pharynx is a somewhat frequent site for their development, the operative procedure indicated in the one case being very different from that in the other. A pharyngeal fibroma usually gives rise to bilateral stenosis; while in its early stage, and usually till the tumor has grown to considerable size, a nasal fibroma causes unilateral stenosis. Dolbeau seems to attach considerable importance to this diagnostic symptom, but takes the ground that the unilateral stenosis characterizes the naso-pharyngeal growth. I am disposed to think, however, that a tumor springing from the base of the skull will give rise to obstruction of both posterior nares, as it grows downward, forming a curtain, as it were, much earlier than the nasal tumor having its origin in one passage. Furthermore, the peculiar frog-face is a characteristic of the nasal growth, a feature usually not so prominent in the pharyngeal disease. The determination, then, of the site must be based on such careful study of the parts as the size of the growth permits, by both rhinoscopic examination and palpation, together with the use of the probe, in connection with a careful estimate of the subjective symptoms. In the majority of cases, the growth springs from the upper portions of the cavity, either from the ethmoid bone or from the region of the superior turbinated, although in several cases its origin was in the floor of the nares, while in Fischer's and Dolbeau's cases it sprang from the septum.

Prognosis.—On account of its location and its nearness to vital parts, a fibroma of the nose will eventually prove fatal, unless subjected to successful operative interference. That, however, a favorable termination may be expected from this interference, is very strikingly shown by the results of the cases reported. We find that the growth was successfully extirpated in all but four, while in four death occurred, in all cases as the result of the operation.

Treatment.—No local treatment has ever been demonstrated to possess any power whatever in arresting the growth of these tumors. A surgical operation is always necessary for their removal. If the growth can be embraced in the loop of a cold-wire snare or the galvano-cautery écraseur, probably we possess no better method for its removal. The choice of the cold or the heated wire, of course, will be dictated largely by the individual preferences of the operator. It has been almost the universal practice to use No. 5 steel piano wire in the snare. It certainly would be wiser, in fibroma of the nose, to make use of the larger sizes, in order to avoid the possibility of any accident happening, as did in a case of Seiler's, by the breaking of the wire. If the growth is of large size, there is no objection

to removing it piecemeal, if this is feasible. When, however, this cannot be done, Casselberry's device can be resorted to, which consists in incising the growth by means of the galvano-cautery knife, after which the snare can be easily adjusted over the two tongues, as it were, which are thus produced. In several cases evulsion was practised, and apparently with success, but it is a method of operation which would scarcely be considered a proper surgical procedure at the present day. In many cases, however, one of the operations alluded to in the chapter on the External Surgery of the Nose, will be necessary. In one case, the soft palate was slit, and the growth dragged down, and cut with a knife, while in another access to the cavity was obtained, by opening through both the soft and hard palate; this latter procedure, however, was resorted to through a mistaken idea that the growth was naso-pharyngeal.

The great danger which attends an operation on a nasal fibroma, lies in the excessive hemorrhage. We possess no means of eliminating this danger, as it is concomitant of this form of tumor, and must be managed by the rules which govern general surgical procedure.

CHAPTER XXX.

OSTEOMA OF THE NASAL PASSAGES.

We use the term osteoma to describe that very grave form of osseous neoplasm, which, having its origin in the upper portion of the nasal cavity, or in one of the accessory sinuses, extends slowly but surely, until it invades neighboring parts, or projects beyond the cavity, producing oftentimes most unsightly external deformity. In most cases, these tumors, in their development, retain connection with the parts from which they originate, constituting what are ordinarily called living osteomata. In other cases this connection may be severed as the result of a blow or some unknown cause, and the fragment remain imprisoned in the cavity, as a source of irritation, constituting what is known as a dead osteoma.

While it is not an especially rare occurrence for the nasal cavity to be invaded by an osseous tumor which has its origin in parts beyond, a neoplasm of this form, developing primarily in this region, is much less frequent. Its occurrence is evidenced by such unmistakable signs that we can easily understand how it should have been recognized by the earliest writers on medicine, and yet their observations were so lacking in definite data as to add little to our clinical knowledge of the disease.

Etiology.—It is difficult to assign any direct cause for these growths, and any suggestion would be merely speculative. They ordinarily commence somewhat early in life, usually at from fifteen to twenty, although they have been known to begin much later. In the majority of instances they occur in males, although why this should be it is difficult to say.

Symptomatology.—External deformity seems to be the earliest symptoms to which these growths give rise. This is due to the fact that the growth has its origin in the upper portion of the nasal cavity, and extends toward the face, even before it involves the lower meatus. In the same way, it very early shows a disposition to invade neighboring cavities, its most frequent track, perhaps, being through the ethmoid cells to the orbit, giving rise to exophthalmos. Epistaxis does not usually occur. Pain, however, due to pressure on

some of the sensory nerves, is of frequent occurrence. Nasal stenosis is of course dependent upon the size and direction which the growth takes. Discharge from the nose is not usually a prominent symptom.

Pathology.—These tumors are met with in two varieties, the hard and soft. In one case the growth is made up entirely of compact tissue, in the other of cancellous tissue, covered by a thin shell of hard bone. The starting-point of the morbid process in these tumors is still somewhat a matter of speculation. They may arise from the ossification of the islands of cartilage, which are occasionally found as survivals of the original process by which the bones of the skull are formed; or their starting-point may be in the minute centres of calcification, which Verneuil has demonstrated to exist in the mucous membrane. Whichever of these theories may be true, the source of these growths is undoubtedly in the periosteum. There is good ground for supposing that their primary origin is always in one of the accessory sinuses. Speaking generally, we are safe in accepting Dolbeau's view, that they may arise from any portion of the mucous membrane, either of the nose or accessory cavities; their frequency in the accessory cavities, and especially in the ethmoid, being closely connected with the peculiar tendency to calcareous degeneration alluded to in the discussion of the pathology of disease of the antrum.

The surface of these tumors is irregularly lobulated and covered with normal mucous membrane, the deep layer of which forms the periosteum. The outer layer of the tumor is invariably formed of compact bone tissue, differing in no essential degree from normal bone of this character. In many cases, the entire tumor is composed of this tissue, while in others, as we penetrate beneath the surface, we come upon the cancellous tissue, still preserving the normal type, and differing from it only in that the Haversian systems are somewhat distorted, and perhaps, in most instances, crowded together, as it were, into a denser tissue than the normal. At its onset, the development of these tumors is equal and peripheral, giving a cylindrical and rounded contour. As they impinge upon the bony walls of the cavity, this rounded shape is interfered with in such a way that the surface becomes nodulated, and, furthermore, prolongations develop in the direction of least resistance. As the tumor develops, the point of attachment becomes relatively very small, and as it is composed of spongy tissue it is easily broken off, either by the weight of the tumor or by a blow.

Diagnosis.—Examination of the parts should enable us to recognize the existence of the tumor at a comparatively early stage; the presence of bone is in every case easily determined, by means of a probe, or, when feasible, by the insertion of the finger. If there be

any doubt as to its structure, the exploring needle is sufficient to remove this. The nicer points of diagnosis, such as between an osteoma and an osteo-sarcoma, can only be determind by removing a portion of the tumor and subjecting it to a microscopical examination. The growth is firm and absolutely immovable, except in those cases in which spontanous separation has occurred; hence its mobility must always be accepted as evidence of this occurrence. If the tumor has remained in the cavity for a prolonged period of time after separation, it may present the appearance of a rhinolith; the mucous membrane having slonghed away, there is a profuse and offensive discharge. In this case, the diagnosis would only be cleared after the removal of the growth.

Prognosis.—After spontaneous separation, there is no tendency to recurrence, the only condition to deal with being the removal of what is now merely a foreign body in the nose. When this fortunate accident does not occur, these growths may attain large size and involve very serious external facial deformity, and yet the prognosis seems to be favorable in the very large majority of cases, in that surgical interference is usually attended with complete success.

Treatment.—An external operation in most instances will be required, the special features of which will be determined largely by the form and size of the tumor. This will often demand free incisions and the extensive removal of such bony structures as may stand in the way of free access to the pedicle. When this is reached, the separation is easily accomplished by means of the chisel, crushing-forceps, or the saw. The only serious accident that may occur, in connection with the operation, is excessive hemorrhage, which is fortunately somewhat rare. Occasionally these growths may be removed from inside with the snare, if the pedicle can be reached.

CHAPTER XXXI.

PAPILLOMA OF THE NASAL PASSAGES.

Papillomata, or warty growths of the mucous membranes, in general would seem to find a predisposing cause in the functional movements of the part; hence the nasal cavity, protected by its bony walls, whose functions are carried on in a state of absolute quiescence, we should naturally infer, should be to a large extent exempt from this form of neoplasm, a fact which clinical observation fully confirms. My own records include something over two hundred cases of benign tumors of the nose, but one of which was a case of papilloma. Schmiegelow found one case in seventeen of nasal tumors, while Zuckerkandl found one in thirty-four. On the other hand, Hopmann says that he found seventy-eight papillomata in four hundred and thirty cases. It is very probable that we have been in the habit of overlooking these cases.

Etiology.—It is not easy to assign any definite cause for the occurrence of this form of neoplasm in the nose. Hopmann gives prominence to atrophic rhinitis as exciting their growth.

Symptomatology.—These growths are attended with no prominent subjective symptoms, other than the interference with normal nasal respiration. They excite but little irritation, and hence excessive discharge does not usually exist. Hemorrhage occasionally occurs, probably due to erosion of the mucous membrane, rather than to a rupture of blood-vessels in the tumor. Their growth is neither rapid nor vigorous, hence, when they even completely fill the nasal cavity, they are not capable of producing notable external deformity. Their presence, therefore, gives rise simply to the ordinary symptoms which attend the development of the softer non-malignant growths.

Pathology.—According to the usually accepted view, papillomatous growths of the nasal mucous membrane consist essentially of an hypertrophy of all the elements which enter into the formation of the normal papillæ of the membrane, this hypertrophy involving these elements uniformly; or the greatest activity of the morbid process may develop in a single element, such as either the connective tissue

or the blood-vessels. Microscopic examination shows each individual papilla to be composed of a framework of more or less richly distributed connective tissue, containing usually a single vascular loop, and the whole covered with epithelial cells. Gland tissue is rarely present, and, when present, shows itself in a disorganized or atrophied condition.

At the base of the papillæ the glandular elements of the membrane show a tendency to proliferation. If we examine a cross-section of the papilla, the microscope will show the central blood-vessels separated by the delicate connective-tissue structures, and surrounded by a ring, as it were, of epithelial cells.

According to Hopmann, papillomata of the nose occur in two varieties, a hard and soft form.

Diagnosis.—The small growths, which appear near the margin of the nostril, are not unlike warty growths as seen on the integument;

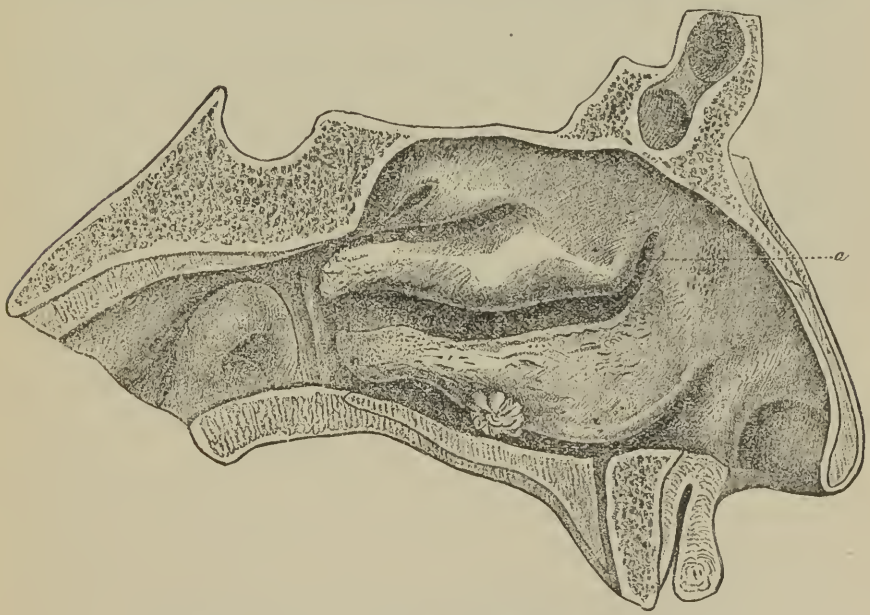

Fig. 46.—Papilloma of the Nasal Mucous Membrane. (Zuckerkandl.)

they have a grayish-pink tinge, and mammillated contour. In this region the growths are usually of Hopmann's hard variety, and do not ordinarily attain any very great size. When they occur higher up in the nasal cavity, they are of a softer consistency, pinker in color, and attain a much larger size, while the whole growth is usually sessile in character. While the individual papillæ may attain considerable size and present the appearance of an ordinary mucous

polyp, the whole growth presents an exceedingly irregular surface, not unlike perhaps the surface of a raspberry, in which each seed follicle projects and becomes to a certain extent pendulous.

Any doubts in the diagnosis can easily be cleared up by subjecting a portion of the growth to a microscopic examination. They seem to be more frequent in females than in males, and belong to early adult life, although no age is exempt from them. According to Hopmann, the soft variety is much more common, and arises invariably from the lower turbinated bodies. The hard variety occurs near the muco-cutaneous junction, and may spring from the septum, floor, or the inner face of the ala. The gross appearance of a small soft papilloma is well illustrated in Fig. 46.

Prognosis.—These growths develop somewhat slowly, and as a rule involve no serious danger either to health or to life.

Treatment.—The soft tumors are to be treated in much the same manner as an ordinary nasal polypus; they are to be extirpated with the least injury to healthy structures. I think this is best done by the cold snare. The question of cauterizing the base of the growth, I think, should be decided entirely by a close observation of each individual case, and the recognition of any tendency to recurrence. In the small hard variety, situated near the margin of the nostril, the growth is easily removed by the cold snare. If the snare cannot be used, there is no objection to the use of either the scissors or knife. In this variety, it will probably be found best, in most instances, to cauterize the base of the growth. For this purpose, perhaps chromic acid or acetic acid will give the best results, in that they are the least irritating of the chemical agents used for this purpose. Furthermore, cauterization will often become necessary to control hemorrhage.

CHAPTER XXXII.

ADENOMA OF THE NASAL PASSAGES.

The nasal mucous membrane does not seem to be a favorable site for the development of this form of neoplasm, in that this tissue is but scantily endowed with glandular structures. As we have already seen, the special function of the glands and follicles in the mucous membrane is to furnish it with sufficient moisture to keep it soft and pliable. This demand is exceedingly limited in the nasal cavity, whose lining is constantly bathed by the serous exosmosis, which constitutes the respiratory function of the nose. Hence, with an exceedingly small number of glands, whose function is by no means active, the tendency to the development of glandular tumors would naturally be but very slight, and, in fact, it is a nice question, if, from a clinical standpoint, they are ever met with in this region. Gosselin has reported two cases as instances of adenoma in the nasal passages. We must conclude, however, from the clinical history and pathological descriptions given in the reports that they were cases of adeno-sarcoma. Pugliese has also described a case in which there was undoubtedly a glandular tumor. In this case, however, the tumor commenced in the lachrymal sac.

Certainly, until further clinical evidence of the fact has been established, we must conclude that unmixed adenoma does not occur in the nasal cavity, and that when glandular tissue is met with in a neoplasm it is purely adventitious, and the clinical significance of the growth is to be determined by the preponderance of other elements, as in adeno-sarcoma, adeno-carcinoma, adeno-fibroma, adeno-myxoma, etc.

CHAPTER XXXIII.

CYSTOMA OF THE NASAL PASSAGES.

A CYSTIC tumor involving the mucous membrane in the upper air passages probably arises in all cases from the adenoid tissue of the membrane, either as the result of degenerative changes, or from retention of the normal secretion. As we have already seen, morbid changes in the glandular structures of the pituitary membrane, from a clinical point of view, scarcely ever occur. Hence, we can easily understand how a cystic tumor in this region is among the rarest of occurrences.

This form of neoplasm is simple in character and easily dealt with, giving rise to no notable subjective symptoms, other than stenosis with catarrhal discharge. It presents no appearances which render it easy to distinguish it from ordinary nasal polypus, other than the fact that it occurs singly, although perhaps a careful examination will reveal the fact of its containing fluid contents. It would seem from a clinical standpoint that it is to be treated in much the same manner as an ordinary nasal polypus, without requiring the nicer manipulation necessary in dealing with myxoma to prevent recurrence.

CHAPTER XXXIV.

ANGIOMA OF THE NASAL PASSAGES.

Considering the highly vascular character of the nasal mucous membrane, together with the activity of its functional processes, we would naturally suppose it to be a favorable site for the development of angiomatous tumors, yet, as a matter of clinical fact, they occur very rarely in this region.

Etiology.—The essential pathological lesion which seems to govern the development of this form of neoplasm, does not seem to be primarily in a disturbance of the circulation or in any condition which leads to a distention of the normal blood-vessels, but it is rather to be looked upon as due to some disturbance in the process of nutrition in the vascular walls themselves. We are unable to assign any definite cause, either active or predisposing, for the development of these neoplasms.

Symptomatology.—The symptoms which arise from the presence of these growths in the nose are largely mechanical, nasal respiration being interrupted, according to the size of the tumor, while its presence also excites a certain amount of muco-purulent discharge. As would be naturally inferred, their presence is attended with frequent attacks of epistaxis, although this rarely seems to be of a violent character, and yet its frequent recurrence may lead to a notable impairment of the general health. External deformity, dependent on any dislocation of the hard parts, is never present.

Pathology.—This form of tumor is composed almost entirely of blood-vessels, held together by a slight network of connective tissue. Their mode of development is not known. Their starting-point may be in a primary dilatation of the normal vascular structures, or, what is more probable, we may have an excessive activity of the normal nutritive processes by which normal blood-vessels are formed. This process results in the formation of a tumor, in which nutritive activity expends itself, as it were, in developing the walls of the blood-vessels, leaving no energy for the development of the other elements of the tissue. The vascular walls produced in this way are necessarily

feeble, and possess slight powers of resistance. The course of each blood-vessel is marked by dilatation and the formation of even large spaces, as it were, scattered throughout the growth. An examination of the tissue under the microscope shows a network of wavy connective tissue, in some places densely packed together, and in other places of exceedingly delicate structure; these bands surrounding spaces, as it were, of varying sizes, each space indicating a blood course, and yet ordinarily the blood-vessels in their continuity cannot be traced. Many of these blood spaces are lined with epithelium, while in others this element is entirely absent. The outer surface of the tumor shows evidences of the development of a capsule, which seems to be of later growth, while above this is a superficial layer of the mucous membrane, the gland structures having undergone partial or complete degeneration. No portion of the nasal cavity seems exempt from these growths, but they usually occur rather nearer the anterior nares.

Diagnosis.—These growths usually present appearances sufficiently characteristic to make their recognition comparatively easy. Their surface is somewhat irregularly rounded, and presents a reddish or purplish hue, which indicates unmistakably their highly vascular character, a lighter red color indicating usually a larger element of arterial blood in the growth. The fluid character of the contents of the growth is further evidenced by manipulation with the probe, which shows them easily indented. This matter of examination, however, should be accomplished with great care, in that they are easily punctured by the probe, whereby hemorrhage of an exceedingly troublesome character may supervene. If they are within reach of the finger, or even by ocular inspection, pulsation of a more or less decided character may be recognized. There is probably no growth which might lead to an error in diagnosis, unless possibly that of a varix springing from the base of the brain. This condition, however, would be indicated by the existence of symptoms referable to the brain.

Course and Prognosis.—These growths develop slowly, and run a somewhat protracted course, of usually from two to five years. They involve generally no danger to life, and are ordinarily amenable to surgical treatment, their removal not being attended with any great danger, while there is no tendency to recurrence.

Treatment.—The only danger to be anticipated in the removal of these growths lies in the excessive hemorrhage which may attend the operation. It is scarcely necessary to say that the forceps never should be used. Perhaps no device will accomplish their removal more safely than the snare, preferably the cold wire, and it should be

removed very slowly. This is a point on which Jarvis laid special emphasis; he occupied three hours in tightening his loop, and the operation was attended with the loss of but a few drops of blood. Furthermore, the loop should be adjusted well down upon the pedicle, where there is less danger of hemorrhage than in cutting through the body of the growth.

CHAPTER XXXV.

CHONDROMA OF THE NASAL PASSAGES.

The use of this term should be restricted to that large, round, nodulated tumor, so very rarely met with in the nose, which presents all the clinical characteristics of a fibroma, and yet which, on examination, is found to contain hyaline cartilage.

We can assign no cause for the development of these growths, although they seem to belong to the period of adolescence, viz., from eleven to seventeen years of age. When present, they give rise to much the same train of symptoms as are met with in fibroma, viz., nasal stenosis, muco-purulent discharge, which may be offensive as the result of retention, together with marked external deformity, although neither epistaxis nor pain occurs. Their development is even slower than that of fibroma.

They are easily recognized by their exceeding great density, and also by their immobility. They are of a yellowish pink color, irregularly nodulated surface, and present a hard cartilaginous sensation to the touch. They can be readily distinguished from an osteoma by means of the needle, although they may easily be confused with a fibroma, recognition being made only by an examination of a portion of the growth, after removal. They are usually not larger than a grain of corn, but may attain sufficient size to seriously impede respiration. They are ordinarily situated at the junction of the cartilaginous septum with one of the alar cartilages, that is, at the anterior inferior angle of the cartilaginous septum.

The prognosis is usually good, in that the growth appears to be quite amenable to surgical interference, either by an external operation or the cold snare.

CHAPTER XXXVI.

SARCOMA OF THE NASAL PASSAGES.

Under the general term of cancer, formerly, were embraced all forms of malignant tumors, carcinomata as well as what are now termed sarcomata. A distinction has been made, in our day, between carcinoma and sarcoma; both are considered malignant growths, but they differ in a marked degree, not only in their course and clinical history, but also in their prognosis. Sarcoma is by no means frequently met with in the nasal passages, and its literature is somewhat limited.

Etiology.—As regards the etiology of this affection, but little is known. It is possible that a spontaneous conversion of myxoma into sarcoma may occur.

It is perhaps true that catarrhal inflammation of the nose may predispose to sarcoma.

A very noticeable feature of sarcoma of the nose is the age at which it seems to develop. According to my experience, while there were a few instances in elderly people, the very large proportion of them occurred earlier than the age of forty, the average being something less than thirty-nine, differing in this respect, in a very marked degree, from the clinical history of cancer, which develops, as a rule, late in life. It was also noticed that sarcoma seemed to run a somewhat slow course when it developed in the nose.

Pathology.—The structure of sarcoma of the nose differs in no essential respect from the same morbid process as developed in other portions of the body, except in so far as it is modified by the special tissue from which it develops. It must be borne in mind that the normal membrane of the nose is exceedingly rich in lymphoid tissue, which oftentimes bears a somewhat confusing resemblance to the structure of round-celled sarcoma.

The surface of the growth is sometimes covered with flattened epithelium, due to the mechanical pressure upon the normal columnar epithelium.

Symptomatology.—The prominent symptom of the presence of a

sarcomatous growth, as of every nasal tumor, is in the obstruction of nasal respiration. Coincident, however, with this symptom, in the large majority of cases, occurs epistaxis, of a more or less violent character. This symptom seems to be strikingly characteristic of sarcoma, as also of fibroid.

The discharge from the nose is of a sero-sanguinolent character, and usually gives rise to quite an offensive odor. The fetor is undoubtedly due to retention of secretion, with decomposition of its organic constituents.

Deformity of the nose depends on the size and consistency of the growth.

Diagnosis.—The gross appearance of the growth presenting in the nasal cavity is a bluish-gray surface, with a soft flabby consistency, which should in all cases excite suspicion of the existence of a malignant disease, especially in connection with the repeated hemorrhages which so frequently occur in these cases. The diagnosis, however, will always depend upon the microscopic examination of a portion of the growth. Furthermore, impact upon the growth with a probe will show it to be, to a certain extent, movable in the nasal cavity, as the tumors are invariably pedunculated. They spring with about equal frequency from both the outer and the inner wall of the cavity, and usually occur as a single tumor.

Prognosis.—An analysis of the cases reported, would seem to indicate that in about half of them the patients recovered, and yet I am disposed to think that the prognosis is not so favorable, as our knowledge of the subsequent history is not sufficiently definite to warrant us in the conclusion that the disease was eradicated. Yet sarcoma in the nose apparently does not present the same malignant tendencies as it does when found in other localities. In many instances, its progress is extremely slow, and apparently is arrested with ease. Age seems to exercise a certain amount of influence on the prognosis of these cases, in that in advanced life the disease is less amenable to operative interference than in youth. Aside from these considerations, our prognosis must be based on the extent of the disease, its duration, and especially on its apparent rapidity of growth. The character of the growth has an important bearing on the prognosis, in that a round-cell sarcoma is to be regarded as more malignant in its tendencies than the other varieties. In those cases in which we find the sarcomatous elements intermingled with the normal tissue elements the prognosis is rendered less grave.

Treatment.—There are no local applications which have the slightest effect on a sarcomatous tumor in the nose. The only treatment is the thorough and complete eradication of the growth, and

this at the earliest period possible, without regard to the character of the tissue. If there is a marked hemorrhagic disposition, as in the angiomatous tumors, the operation should be proceeded with as rapidly as possible, without regard to the hemorrhage, as this complication can be controlled when its arrest becomes necessary. Furthermore, I think, ordinarily the growth should be removed through the natural passages when it is feasible, although, if better access to the nasal cavities is demanded, an operation on the external nose does not necessarily complicate the final result. The growth may be extirpated by the curette, spoon, the cold snare, or the galvano-cautery loop. Probably the cold-wire loop, properly manipulated, affords the best method of removing the small tumors, and the larger growths, even, may be removed piecemeal by this method. This manipulation, certainly, is easier of accomplishment than the application of the galvano-cautery loop; and furthermore, I think it is a nice question, oftentimes, whether the galvano-cautery should be used, as I am convinced, from my own personal experience, that it may stimulate a sarcomatous tumor to renewed activity of growth. The most serious obstacle met with in these operations is always the excessive hemorrhage. The source of the hemorrhage is always the tumor itself, and the indications are to get the growth out as rapidly as possible and to get down to its attachments. When this part is reached, the hemorrhage, as a rule, ceases at once. In a rapid operation, then, either bimanual manipulation, by means of one finger in the nostril and one in the nares, will be resorted to, or the curette will be used through the nostril, its manipulation being aided by the finger in the posterior nares. In order to facilitate this manipulation, an incision may be made through the soft palate. In operating in this way it is necessary that the mouth should be held open by a mouth gag, while an assistant stands ready to prevent the blood from flowing down into the larynx and trachea, although in many cases the choanæ are sufficiently plugged by the growth itself, until the posterior attachments are thoroughly severed, after which, by tilting the head forward, the blood makes its escape from the anterior nares. After the growth has been removed, the subsequent hemorrhage is easily controlled by packing the nose with one or more small sponges.

The primary operation on these growths I regard as but the commencement of treatment, the more important part being the subsequent close watching of the cavity, to arrest and control any tendency to a reappearance of the growth.

As regards the advisability of cauterizing the base of the tumor, by means of the galvano-cautery or some one of the various chemical agents, I think this is oftentimes not only uncalled for, but mischie-

vous, while in other cases their use would seem to be attended with the best results. The only indication here, then, will be that any caustic agent for the control of sarcomatous recurrence, must be used with the greatest possible care, and its immediate effect watched.

The first stage of chloroform anæsthesia is quite sufficient for the primary operation. When the growth is smaller, local anæsthesia with cocaine is all that will be required.

CHAPTER XXXVII.

CARCINOMA OF THE NASAL PASSAGES.

It would seem that there is nothing in the morbid process constituting catarrhal inflammation which favors the development of malignant disease, for, while inflammatory action of the nasal mucous membrane is one of the most frequent affections, I think Grynfeldt's view must be accepted, that a malignant disease in this region is one of the rarest conditions. That it should be so rare is probably due in some degree to the fact that the nasal mucous membrane, inclosed within its bony walls, is so thoroughly protected from any constantly acting traumatic or directly irritating influences. That carcinoma may have its primary origin in the nasal cavity, however, cannot be questioned, in face of testimony given by many authorities.

Etiology.—It is a very easy matter, after malignant disease has developed, to trace its origin back to some injury received in previous years, and yet to connect the injury in a direct positive relation with the development of the cancer is by no means so easy a matter. Hence, when we say that a cancer may be due to traumatism, it is a suggestion not clearly warranted by clinical observation. Heredity is the one powerful predisposing cause of the disease. Aside from this consideration, I do not think we know why malignant disease occurs.

The question of the transformation of a benign into a malignant growth has already been discussed in the chapter on nasal polypi. A certain amount of clinical evidence seems to show that a nasal polyp may be transformed into a sarcoma, when subjected to unwarrantably harsh interference, yet there is no ground for supposing that a carcinomatous transformation ever takes place.

As regards the age at which the disease develops, cancerous deposits in the nose follow the same course as in other parts of the body, occurring, as a rule, after middle life, with very rare exceptions which have occurred in childhood.

Pathology.—Carcinoma of the nose, from a pathological point of

view, presents no characteristics which differ from the same form of tumor in other portions of the body. Hence a full description of the minute pathology of these growths need not be given here.

Symptomatology.—The character of this disease is specially suggested by the occurrence of a peculiar sero-sanguinolent acrid discharge. Epistaxis occurs in a certain proportion of cases, but perhaps not so frequently as is the case with sarcoma of the nose. Pain, which is usually so prominent a symptom of the development of cancer elsewhere, does not seem to be characteristic of the disease when met with in the nasal passages. Nasal stenosis, with deformity of the external nose, of course, is present, according to the duration and extent of the disease. As the tumor invades the sphenoid and ethmoid cells, we have the symptoms characteristic of disease in these cavities, such as exophthalmos, impairment of vision, etc.

Enlargement of the lymphatic glands does not seem to be a frequent concomitant of the disease, although occasionally noted. Maisonneuve does not find the submaxillary glands enlarged unless the antrum is involved, with infiltration of the skin in the infra-orbital region.

In cases reported by Earle and by Watson secondary carcinomatous deposits were found in certain of the viscera on autopsy, although not giving rise to any symptoms which led to their recognition before death.

Diagnosis.—With our present methods of examining the nasal cavities, a growth should always be recognized very early in its development, when a small portion can be removed for examination with the microscope, which will reveal its character. This removal should in all cases be accomplished by means of the cold-wire snare, as avoiding any unnecessary harshness in manipulating the growth, whereby a renewed activity of development might be stimulated. In sarcoma secondary enlargement of the cervical glands is never present. In carcinoma, however, this symptom seems to be present in a few cases. Ulceration of the surface of carcinomatous tumors is more frequently met with than in sarcomatous growths, and hence the former are more liable to be the seat of hemorrhages.

Prognosis.—The prognosis of carcinomatous deposits in the nasal passages is essentially grave. In cancer, in general, we usually accept the view that the average duration of life is three years. From a review of numerous cases, however, it would seem that the prognosis in carcinoma of the nasal passages is more unfavorable, the duration of life in many instances being only twelve months. Furthermore, the time of life seems to have a certain influence, as it would appear that when the disease develops late in life it runs a very

rapid course. The character of the tumor does not seem to modify the prognosis in any marked way.

The cases which have been reported as cured were all undoubtedly instances of cylindroma, a form of tumor which seems to be somewhat vaguely classified by pathologists, and which, while presenting certain histological evidences of malignancy, from a clinical point of view manifests but very slight malignant tendencies, and perhaps, therefore, should not be regarded as a malignant disease. The prognosis in cylindroma as to the successful arrest of the disease, if recognized sufficiently early, and before the disease has invaded inaccessible parts, such as the sphenoid or ethmoid cells, is to be regarded as favorable. The cause of death, in most of these cases, is exhaustion, unless death follows immediately upon an operation. The malignant process, having its origin in the nasal cavity proper, successively invades the accessory sinuses, and, in still rarer cases, the cranial cavity.

Treatment.—If the microscopic examination shows that the disease consists of cylindroma, treatment may be undertaken with every promise of success; but in all cases, harsh or irritating measures, whereby a greater malignancy of growth might be developed, should be avoided. Hence, in these cases, the growth should be removed, preferably by means of a cold snare, and possibly the curette, and the base cauterized, perhaps, but the caustic applied with great care, and somewhat sparingly, the action of the agent being closely observed. When the growth has obtained considerable size, a more radical and rapid operation becomes necessary. If we have to do with carcinoma, it becomes a nice question how far life may be prolonged by the radical operation. I know of no well-authenticated case of the successful removal of a carcinoma of the nose, through the natural passages. In the majority of instances, the growth has its origin in the upper and narrower portion of the nose, in close proximity to the superior turbinated bones; hence, even when early recognized, it has invaded regions almost inaccessible by the simpler manipulations. Of course, if the growth is small and within reach, it becomes our duty to remove it in this manner if possible. The results reported in cases operated upon offer a most discouraging outlook, as in all but four of them surgical interference shortened rather than prolonged life.

CHAPTER XXXVIII.

DISEASES OF THE ACCESSORY SINUSES OF THE NOSE.

Under this consideration is included a study of the diseased conditions which involve the cavities found in certain of the bones of the face and skull, which communicate with the nasal passages by one or more small openings. These cavities are: the antra of Highmore, or the maxillary sinuses; the ethmoidal, the sphenoidal, and the frontal sinuses.

Disease of the Antrum.

This term is used to designate a not infrequent complication or concomitant of catarrhal inflammation of the nasal mucous membrane, which is characterized by an inflammatory process in the mucous membrane lining the antrum of Highmore, which subsequently degenerates into the purulent process. This pus secretion, accumulating in the cavity of the antrum, makes its exit through the ostium maxillare, and escapes into the nasal cavity, giving rise to a more or less profuse pus discharge from the nose.

Etiology.—Zuckerkandl takes the ground that the most frequent cause of the disease lies in an extension of the inflammatory process from the nasal cavity, a view also entertained by Schiffers, Chatellier, and Krause. In a previous chapter, this question of extension of catarrhal inflammation has been discussed somewhat at length, and the ground taken that catarrhal inflammation shows a notable hesitancy in extending from one anatomical region to another. A catarrhal inflammation of the nose is the result of local conditions which do not, in any degree probably, operate in the maxillary sinuses. In other words, so-called nasal catarrh is a perversion of function of the normal respiratory apparatus of the nose, and its causes operate on those tissues only and would have no effect on the delicate membrane lining the antrum. Hence, I think it is an exceedingly rare event that disease of this cavity results by an extension of inflammation through continuity of tissue. This view is notably strengthened when we consider the large number of individuals who

suffer from chronic rhinitis, and the very small proportion of these in which antral disease occurs. That hypertrophic rhinitis is the cause of the disease, in a large number of cases, is undoubtedly true—not by extension, however, but because the hypertrophic process develops in such a manner as to produce stenosis or complete occlusion of the ostium maxillare. Furthermore, as we know, this orifice varies greatly in different individuals. Quite extensive hypertrophy in one case might fail to produce any notable stenosis, while in others a moderate degree of thickening of the membrane might produce complete obstruction. The closure of this orifice would naturally act, in the first place, to produce moderate hyperæmia of the mucous membrane lining the sinus, resulting necessarily in a certain increase of secretion. In health this membrane secretes just sufficient mucus to keep its own surface moistened and no more. Another element enters into this consideration, as pointed out by Zuckerkandl, in that in a patulous condition of the ostium maxillare no considerable amount of moisture is dissipated by evaporation; hence, we can readily perceive that when this orifice is closed there would necessarily be an accumulation of secretion, even were the membrane in a healthy state. Add to this, hyperæmia, with hypersecretions in the lining membrane, and it would become apparent how the secretion must accumulate in the sinus. The necessary result of this is a catarrhal inflammation, which eventually degenerates into one characterized by a purulent discharge, for I regard it as an invariable rule that a catarrhal secretion in a closed cavity must give rise, sooner or later, to a purulent discharge.

It is a very ancient tradition that decayed teeth are a frequent source of purulent disease of the antrum. When we consider that the first and second molar teeth usually project into the floor of the cavity, and occasionally penetrate it (see Fig. 47), we can easily understand how caries of these teeth might act to produce suppuration in the cavity. That carious teeth are a frequent source of the disease, cannot be questioned; that they are the most frequent, is probably not easy to decide. From my own point of view, I should say not, and yet we can easily understand why this has been asserted broadly and with emphasis by an oral surgeon, since cases due to carious teeth, as a rule, fall into the hands of the dentist or oral surgeon, while those cases dependent on other causes naturally fall into the hands of the throat specialist. Watson states that nasal polypi may produce the disease, a cause not usually mentioned by other writers, and yet I regard this as one of the most frequent sources of suppurative inflammation of the antrum. This, it seems to me, can easily be understood when we consider the fact that mucous polypi have

their origin, in the large majority of cases, in the immediate region of the ostium maxillare, and very early in their development act to produce occlusion of this orifice. I am disposed to think that, in many cases, the involvement of the antrum is overlooked, in the somewhat more prominent symptoms to which polypi give rise, and, furthermore, that its purulent discharge, becoming mingled with and diluted, as it were, by the sero-mucous discharge effected by the polypus, fails of recognition as a distinct pus secretion. Certainly in those cases in which the polypi have developed to the extent of completely filling the nasal cavity, producing complete stenosis, I

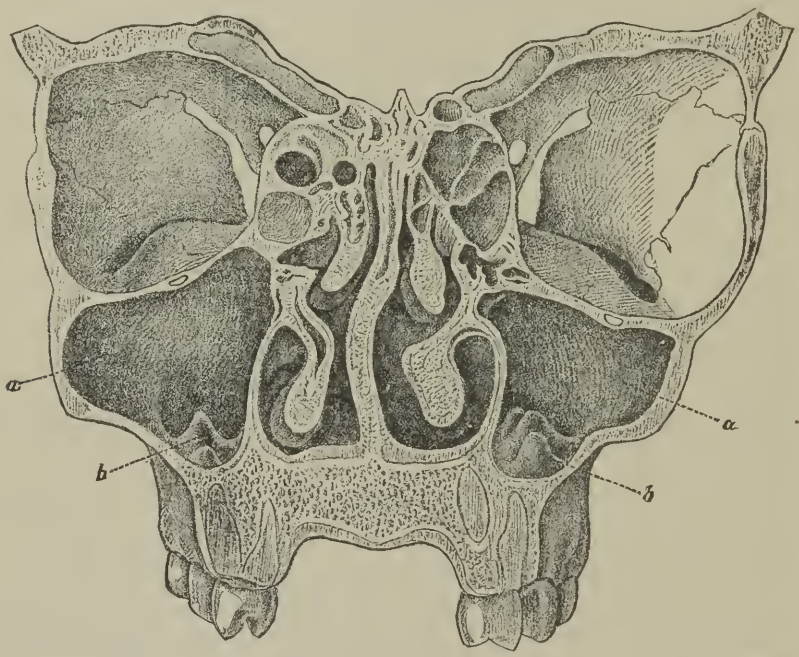

FIG. 47.—Transverse Section of the Maxillary Sinuses, showing the Roots of the Molar Teeth protruding into the Cavities through the Floor. (Zuckerkandl.)

think it is almost the exception that the maxillary sinus does not become the seat of a suppurative inflammation. This complication, however, becomes evident only after the nasal passages have been thoroughly cleared of the polypi. I am disposed to regard this, then, as perhaps the most frequent cause, hypertrophic rhinitis next, and, least frequently, carious teeth. In the same manner, an attack of acute rhinitis is not infrequently attended with symptoms referable to the maxillary sinus, and hence may be an exciting cause of suppurative disease of that cavity. That this accident is not of more frequent occurrence is probably due to the fact that the acute rhinitis

subsides in natural course, before mischief of a sufficiently permanent character has been done to the membrane lining the antrum to lead to the development of the chronic lesion. The same may be said of croupous and diphtheritic inflammation of the nasal cavity. Furthermore, it should be mentioned that Zuckerkandl has stated that the mucous membrane lining the antrum does not present the anatomical characteristics which favor the development of a fibrinous exudation, and hence an inflammation of this membrane would be of a simple catarrhal character, even in the event of its being excited by the croupous or diphtheritic lesion in the nose.

Among the somewhat rare causes of the disease may be mentioned traumatism. Cases have been cited as resulting from an accident attendant upon parturition, from Malgaigne's operation for division of the infra-orbital nerve, and from an attack of facial erysipelas.

I believe it to be purely a local disease, and due to local causes, although Watson makes the broad statement that the general health is almost always at fault.

Pathology.—At the onset of the affection, the mucous membrane is hyperæmic, slightly swollen, and with its surface dotted over with minute points of ecchymosis, due to the fact that the blood-vessels coursing through the membrane possess exceedingly thin, delicate walls which rupture easily, giving rise to slight localized hemorrhages. As the disease progresses, the membrane becomes swollen to ten or fifteen times its normal thickness, this swelling being largely due to an œdematous condition, which presents somewhat irregularly, giving rise to small localized tumefactions, producing a somewhat mammillated contour. This infiltration involves not only the superficial, but the deep layer of the membrane, which in this region constitutes the periosteum of the bony walls of the sinuses. In connection with this there is a somewhat profuse serous exudation, under which the blood-vessels unload themselves, and the swollen membrane to an extent subsides, followed by a more or less profuse secretion of sero-mucus, together with blood, and this in the course of time, occupying weeks or perhaps months, results finally in a discharge of pure, laudable pus. The later stages of the disease are characterized by a certain activity in the deep layers of the membrane or periosteum, under which there are formed lamellæ or spiculæ of new bone, which may project into the cavity, or may form thin plates, crossing it in such a way as to divide it into two or more small chambers. This perversion of function may go so far as to lead to the formation of small bony tumors within the cavity, entirely separated from its walls. This process is probably closely allied to calcareous degeneration of the mucous membrane.

Symptomatology.—At the onset of the disease, if the cavity becomes filled with serum or sero-mucus, whose exit is prevented by an obstruction of the ostium maxillare, pain referable to the region becomes a prominent symptom, together with a sense of fulness and weight below the orbit. Unless relief is soon given, this pain may become of a most agonizing character, extending over the whole side of the face. The pain over the cheek bone involves the upper teeth, which give the impression of being elongated, and crowded out of their sockets, mastication thus becoming painful. In connection with the facial neuralgia, there is liable to be more or less general hyperæsthesia of the face, with tenderness on pressure over the trunks of the nerves, as they emerge from the foramina. This sense of fulness may also be felt in the roof of the mouth, which may be crowded downward from up above and bulged into the oral cavity. Schech states that protrusion of the eyeball, with atrophy of the optic nerve, may occur in connection with antrum disease; while Ziem has reported a case of purulent disease of the antrum, in which the affection had caused narrowing of the field of vision, which disappeared as soon as the pus was evacuated from the maxillary sinus. These symptoms, however, would rather indicate disease of the ethmoidal or possibly the sphenoidal sinuses. These sensations may persist for several days, and are relieved spontaneously, or at the hands of the surgeon. If spontaneous relief occurs, it is usually with a profuse discharge of ill-smelling pus from the nasal cavity of the side affected, mixed with a certain amount of minute blood clots. The escape of pus may be either through the normal opening, or by an artificial opening through the thin lateral wall of the cavity, and, in still rarer cases, the spontaneous evacuation may take place through the alveolus, cheek, or orbit. Among the rarer events is the extension of the disease to neighboring cavities. Thus, in a case reported by Maier, even after opening the antrum through the alveolus, the disease invaded successively the ethmoidal sinuses, the orbit, and the cephalic cavities, resulting in meningitis and death.

After this spontaneous evacuation of the cavity, the pus discharge continues, for, it may be, a lengthened period of time, flowing freely from the nasal passage, when obstruction again occurs, and with its attendant symptoms of pain and sense of fulness about the maxillary region; these symptoms, however, being not so well marked, as a rule, as in the case of a primary attack, the further progress of the disease being characterized by these intermittent attacks of retention. In most cases, perhaps, the disease is chronic from the onset, the ostium maxillare remaining patulous, and the course of the disease never being marked by an attack of pus retention. When this occurs,

the prominent symptom is a discharge, from one nasal cavity, of a more or less profuse purulent secretion, which shows a certain amount of diurnal intermittence. On waking in the morning, a large amount which has accumulated over night is discharged, while through the day the evacuations are in smaller quantities, the patient soiling perhaps three or four handkerchiefs, the pus being of a bright yellow color, and emitting no marked odor, except, perhaps, with the first discharge in the morning. In connection with this, neuralgic pains of a mild character, referable to the side of the face affected, are often noticed, which occasionally extend also to the teeth. In the late stages of this form of the disease, the teeth whose roots project into the floor of the antrum may become carious as the result of periostitis and necrosis involving the thin bony plates covering them.

This would suggest that the carious teeth, which in many cases are said to be the cause of the antrum disease, may rather be the effect of it. Although there may be no obstruction to the escape of the pus, the cavity is probably most of the time full, up to the level of the opening, hence in many cases, as the result of the thinning of the anterior wall, which may become almost parchment-like, a slight bulging, with fluctuation, may be observed over the canine fossa. As the purulent secretion passes into the nasal cavity, it retains its fluidity, and is expelled in the same condition. Crust formation is never a feature of this disease, nor is the mucous membrane of the nose in any way affected by the presence of the pus. Cough may be a prominent symptom, due to the purulent secretion making its way into the pharynx and upper air passages, as it occasionally does, especially on waking in the morning, and in that way becoming an exceedingly disagreeable and oftentimes a distressing symptom. In the same manner, I should attribute any symptoms referable to the upper air tract to a concurrent disease of the nasal mucous membrane, rather than to direct influence of the antral affection.

Diagnosis.—A pus discharge from but one nasal cavity should always excite suspicion of the existence of suppurative disease of one of the accessory sinuses. The only affections which give rise to a unilateral pus discharge from the nose are foreign bodies, syphilis, and neoplasms, in all of which the accompanying symptoms are so prominent that a differential diagnosis should never be difficult. The character of the pus discharge in antrum disease, in all cases probably, is that of a uniformly bright yellow, cleanly secretion, and the odor is somewhat characteristic, being that of sulphuretted hydrogen, and never presenting the intolerable fetor characteristic of syphilis, or the musty graveyard odor of ozæna. Furthermore, the odor is present only when pus is evacuated after being retained for a day or longer.

In making an examination of the nasal cavity, a four-per-cent solution of cocaine should first be applied, to contract the tissues, after which, on ocular inspection, there will be found a small mass of bright yellow, canary-colored, or perhaps straw-colored pus, lying on the lower border of the middle turbinated bone, about midway of its course. If the discharge in the nose is free, the secretion will be found coating the lower turbinated body, and possibly lying upon the floor of the nares. If, however, this be wiped away with a pledget of cotton, the origin of the pus will easily be detected, as oozing from beneath the middle turbinated body. If, furthermore, a probe wrapped with a small pledget of cotton be pressed up against the point from which the pus apparently issues, the manipulation will be followed by a flow of pus directly from the cavity, which now will emit, if the pus discharge is free, the characteristic odor of fetid hydrogen. The question of differential diagnosis now arises, to determine from which of the accessory sinuses the pus issues, and this involves some exceedingly nice questions, which are not always easily decided. The best procedure is to direct the patient to lie down on the unaffected side, a position in which discharge from the antrum would be facilitated, while there would be little or no tendency to the escape of pus from any of the other sinuses; hence, keeping in this position for ten minutes or longer, especially if the erect position had been maintained for several hours beforehand, the exit of pus from the maxillary sinus would be obtained, if suppurative disease existed there. Percussion of the two sides should always be resorted to, for by this means we may detect a dulness over the affected side, as well as a certain amount of sensitiveness. Watson suggests tapping the teeth of the upper jaw successively, and, if tenderness be discovered, that the pulp-chamber should be examined with reference to a diseased condition. Tenderness on pressure over the canine fossa, or above the alveolar process in the oral cavity, may constitute a symptom of some diagnostic value, although it is not usually present. Puncture of the antrum by means of an exploring needle, or with the aspirator, is a comparatively simple test, against which there lies no objection, other than the damage of breaking the needle if the bone be thick or dense. This exploration should preferably be made through the outer wall of the antrum, an incision being made through the gingivo-labial fold, above the second molar tooth. Schmidt advises that such an exploratory puncture be made in doubtful cases, by means of a strong, curved aspirating-needle, piercing the internal wall of the antrum, in the inferior meatus of the nose. If either the first or second molar tooth is carious, it should be extracted, and access to the cavity for exploratory purposes is easily obtained through the alveolar process,

although I question the propriety of extracting a sound tooth for this purpose, considering the ease with which the cavity may be entered at the points above mentioned. At best, the diagnosis of these cases is oftentimes quite obscure, and can be obtained only by exclusion and a careful study of symptoms, the only absolute diagnostic sign being gained by access to the cavity.

Prognosis.—These cases rarely involve any danger to life, unless, as may happen, the disease extends to the sphenoidal and ethmoidal sinuses, and yet their diagnosis and treatment occasionally present difficulties, which, although not insurmountable, oftentimes tax the therapeutic resources of the surgeon and weary the patience of the sufferers. Garretson states with a considerable degree of emphasis that "diseases of the antrum are for the most part simple in character, easy of diagnosis, and as a rule not at all difficult of treatment." This is the point of view of the oral surgeon, whose cases are mainly dependent on carious teeth, and which, therefore, yield readily to treatment, by the simple measure of removing the cause, when oftentimes a cure ensues without further treatment. Cases which result from intranasal disorders or traumatism yield less readily, and often require a somewhat prolonged course of treatment. Spontaneous resolution of chronic suppurative disease of the antrum probably never occurs. In an acute catarrhal attack from an acute rhinitis, spontaneous resolution is perhaps the rule.

Treatment.—The essential feature of the treatment of a case of suppurative disease of the antrum consists in opening the cavity for proper drainage, and subsequently its thorough cleansing and disinfection. If it occurs in connection with nasal polpyi, hypertrophic rhinitis, deformity of the septum, or other obstructive lesion, I think it is important that these lesions should be removed as far as possible, by a proper mode of treatment, before further measures are resorted to. The removal of the nasal obstruction offers the hope that the normal orifice of the cavity may be found patulous, in which case a freer drainage will be afforded. In addition to this, disinfecting lotions should be used by the patient several times daily, to prevent the ostium from becoming blocked by accumulated secretions. For this purpose there may be used a solution of carbolic acid, three grains to the ounce, boric acid, twenty grains to the ounce, to which may be added bicarbonate or biborate of soda in the proportion of five grains to the ounce. This can be used by means of the small atomizer (see Fig. 18). After the thorough cleansing of the parts, I have seen excellent results from the use of the following, as a spray:

℞ Terebene, ... ʒ ss.
Ol. petrolati (zero), ... ℥ i.

This process, however, involves a long and somewhat tedious course of treatment, with exceedingly doubtful results, for, in removing the cause of the disease, it is questionable whether we succeed in even modifying the morbid process which has fixed itself upon the mucous membrane lining the cavity, and furthermore it is not probable that fluids injected into the nasal cavity reach to any extent the diseased sinus. We not only require penetration of the cavity, but its thorough cleansing. Wolfram reports a case of antrum disease of six months' standing, cured by the use of the steam atomizer, from which, after the parts were cleansed with the nasal douche, a two-per-cent solution of tannin and glycerin was inhaled twice daily, and subsequently acetate of alum, a cure being effected in a few weeks. Störck treats his cases by local medication through the nose. The nozzle of a syringe is inserted directly into the antral orifice, in those cases in which this is feasible. When this cannot be seen, he uses a syringe with a straight nozzle, the distal opening of which is closed, and the side perforated. Now, by moving this along the middle meatus, he claims that when the jet enters the antrum the patient is conscious of it, and in this way the location of the opening is ascertained, and its distance from the margin of the nostril recorded by a mark on the tube of the syringe. In order to gain freer access to the parts, he states that the nasal passages may be dilated by packing them with pledgets of cotton, previous to the use of the syringe. I know of but one way to dilate the nasal cavity, and that is to contract the tissues by the application of cocaine, as in all forms of mechanical dilatation the stenosis recurs by the return of the blood flow, immediately after the removal of the dilator.

In a large proportion of cases, a successful cure of disease of the maxillary sinus requires that an artificial opening be made. If the first or second molar tooth is carious, or loosened, there can be no question that the access to the cavity is better obtained by its removal. In some cases this procedure will reveal the existence of an opening, while in others, it will be necessary to drill upward through the tooth cavity, until the antrum is reached. The penetration of the sinus should be followed by an escape of pus. We thus have established two openings into the cavity, one of which, being situated in its most dependent portion, presents the conditions essential for its proper drainage. The indications now are the thorough cleansing of the diseased part, while at the same time a patulous condition of the artificial opening is maintained. Cleansing is accomplished by syringing through the artificial opening daily, until the solution escapes through the nasal orifice. The fluids adapted to this are any of those already mentioned. After the cavity is thoroughly cleansed, there

should be injected a mild and unirritating astringent, such as sulphocarbolate of zinc, five grains to the ounce; resorcin, five grains to the ounce; hydro-naphthol, half a grain to the ounce; nitrate of silver, five grains to the ounce, etc. Tincture of iodine may be used in the strength of fifteen minims to the ounce of water. To prevent a closure of the

Fig. 48.—Silver Drainage Tube for the Antrum, full size.

artificial opening, it will be necessary to insert a drainage tube (see Fig. 48). The best form of this is a silver tube three-fourths to one inch long, and one-eighth of an inch in diameter, which should be provided with a collar or flange, by means of which it is attached, by a silk thread, to a neighboring tooth. Salter suggests that a vulcanite plate be made to fit the gum, into which the drainage tube is inserted, of just sufficient length to reach the orifice. The lower end of the drainage tube is so constructed as accurately to fit the nozzle of the syringe, which is used for injecting into the cavity. In case the patient wears artificial teeth, any dental surgeon can easily attach a small piece to the plate, which, pressing against the flange of the tube, will hold it in place. Any small syringe, fitted with a proper nozzle, is adapted for use in these cases. I usually direct the patient to provide himself with an ordinary dental syringe, or an Anel's lachrymal syringe (Fig. 49); with this the cavity is to be cleansed at least twice daily. In

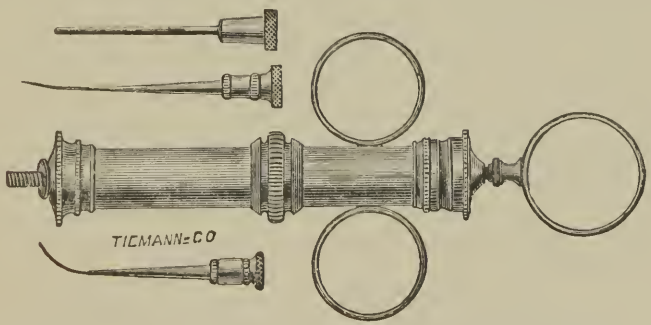

Fig. 49.—Anel's Lachrymal Syringe, for use in Disease of the Antrum.

some instances patients have acquired the habit of cleansing the cavity without the use of a syringe, simply filling the mouth with a solution of salt water, or some other simple lotion, and forcing it through the tube by the lips, cheeks, and tongue, the head being held over a proper receptacle, into which the lotion falls from the nose. The retention of the tube must be continued according to the duration of the pus discharge. In one case of Bordenave's, a cure was effected and

the tube removed at the end of two months, while in another it was retained for two years before it could be removed with safety.

When the cavity is first opened, it is important that it should be thoroughly explored by means of the probe, in order to detect the existence of necrosed bone, or other unusual conditions, as in one case, a supernumerary tooth was the source of the suppuration, while in a case cited by Giraldes local medication failed to arrest the suppurative process, until a bony septum traversing the cavity was discovered and broken up by means of a probe. In those cases in which no evidence of diseased teeth is discovered, the question arises as to the propriety of sacrificing a sound tooth. The only advantage of this lies in the fact that we thereby establish an artificial opening in the most favorable position for securing drainage, viz., in the dependent portion of the cavity. I do not think the advantage of this opening is sufficient to warrant the sacrifice of a sound tooth, when we consider the simplicity and efficacy of the operation first suggested by Mickulicz of opening into the antrum through the inferior meatus. This is done by an instrument which consists of a spear-pointed knife, mounted on a shaft, curved to a right angle, and fitted with a shoulder, about three-eighths of an inch from the point, in such a manner as to regulate the depth of the cut. The instrument being carried within the nostril, the incision is made at a point in the lower meatus, immediately below the normal orifice of the antrum, the direction of the incision being upward, backward, and outward, in order to avoid the hard, bony tissue at the lower border of the septum, which could not be easily penetrated. A diamond-shaped opening is thus established, which is sufficiently near to the floor of the antrum to afford ample drainage facilities, and is also easily accessible for subsequent cleansing and medicating procedures, which are essentially the same as those mentioned in connection with the alveolar opening. The hemorrhage attending the operation is but trivial, and can easily be controlled. Mickulicz states that the operation is impracticable if the entrance is very narrow, or the bones very hard, or when there is extreme hypertrophy of the lower turbinated bone. It need scarcely be stated that the operation should be done with the use of cocaine, which in every case, I think, would so far eliminate the turbinated hypertrophy, by contracting the tissues, as to overcome any obstacle that that condition might present. If the septum by its deflection hamper the manipulation, it can easily be removed by means of the saw. If the bone is found to be sufficiently hard to resist penetration by the knife, a burr or drill, or perhaps Curtis' trephine, can be manipulated by the dental engine or electro-motor.

Mickulicz's operation does not open the antrum at its lowest portion, yet it is sufficient practically to afford ample drainage of the sinus, and I fully agree with Fränkel in the view that the antrum should be opened in the lower meatus, in preference to any other locality, unless a carious molar tooth invites the alveolar opening. There may be conditions rendering it necessary to make the opening through the canine fossa, such as ankylosis of the jaw, preventing the removal of a tooth, in connection with insuperable objections to Mickulicz's operation. An opening in this region offers no special advantages, while the wearing of a drainage tube in this locality might prove a source of considerable annoyance, and, furthermore, it is usually a matter of some difficulty to keep the opening patulous. In those cases in which, as the result of the long retention of pus, the anterior wall of the antrum has become thin, and the pus shows a tendency to point upon the cheek, this disposition should be corrected as soon as possible, by an artificial opening elsewhere, since it is probably never wise to open the antrum through the cheek, as, in that case, a permanent fistulous opening is liable to form.

Diseases of the Ethmoidal Sinuses.

Ethmoidal disease, both from the anatomical character of the regions involved, and with reference to the symptoms to which it gives rise, differs essentially from diseased conditions found in any of the other accessory cavities of the nose. For whereas the maxillary, frontal, and sphenoidal sinuses present to us a single cavity confined by bony walls, the ethmoidal cells consist of a large quadrangular mass of small cells, or trabeculæ, varying in size, and each cell more or less completely separated from its neighbor by a thin, bony partition. Hence while the problem which presents itself to us in dealing with morbid conditions in the other cavities consists simply in making an opening for proper drainage and irrigation, in dealing with diseased processes in the ethmoidal cells the radical arrest or cure of the disease, especially when suppuration has taken place, demands the opening of each of the large number of small cells which compose this mass. This is impossible. Hence we are compelled to resort to the breaking down of these small partitions within the ethmoid body, in such a way as to convert it into one single cavity. And here, perhaps, it may be proper to say that in a diseased condition of any of the accessory cavities I think we will all recognize the fact that the tendency in every case of a simple inflammatory process which does not undergo resolution and which develops into a chronic inflammation is to result in suppurative action, and

thus the establishment of a more or less permanent pus discharge through the normal opening, namely, into the nasal cavity. The other respect in which disease of the ethmoidal cells differs from that of the larger sinuses is that whereas in the latter we have simply a purulent discharge, in the former diseased action sets up a train of symptoms more or less neurotic in character, such as watery discharge from the nose; violent sneezing attacks, asthma, headache, neuralgias, which according to Berger and Tyrman are usually intermittent in character; certain disturbances in the muscular control of the eyeball; asthenopia; and especially what has been called aprosexia. This latter really constitutes one of the most distressing symptoms of the disease, and has been described to me by patients as a sort of blanket over their brain, which interfered with mental activity and the free use of their faculties.

I regard ethmoidal disease as not only by far the most frequent of all diseases of the accessory cavities, but as of very much more frequent occurrence than we ordinarily have been taught to believe, as will be inferred by the statement that in the past five years ninety-eight such cases have come under observation in my private practice.

In the chapter on acute rhinitis, in all of our text-books on throat diseases, there is described a disease characterized often by nasal stenosis, frontal headache, intra-orbital pressure, asthenopia, watery discharge, and violent sneezing, which I very frankly confess I have rarely seen when I was enabled to detect a rational explanation of the symptoms in the morbid condition of the nasal mucous membrane alone, as seen by ocular inspection. I contented myself with the old teaching that these symptoms were to an extent reflex in character. I do not hesitate to say that I believe a very large proportion of the cases of so-called acute rhinitis are really instances of acute ethmoiditis, and that such inflammation as may exist in the nasal mucous membrane is really secondary to the graver and more distressing conditions of the lining membrane of the ethmoidal cells.

Among the cases which I shall briefly analyze later are a number of instances, both of acute ethmoiditis and suppurative disease, which have had their onset in unmistakable attacks of la grippe, which leads me to hazard the suggestion as to whether the influenzal type of la grippe is not really an invasion of the ethmoid cells by the specific bacillus which is supposed to be the exciting cause of that disease.

In a paper on ethmoid disease, I have described five varieties of diseased conditions of these cells, which practically reduced themselves to three, viz.: first, extra-cellular myxomatous degeneration; second, intra-cellular myxomatous degeneration; and third, purulent

ethmoiditis; I think that these three conditions are successive stages of one and the same disease. An acute inflammatory process of the mucous membrane lining these cells very soon either results in resolution or a chronic morbid process. Owing to the peculiar anatomical character of this membrane, a chronic inflammation tends to develop a soft jelly-like thickening of the tissue, which takes on what we may describe as a myxomatous character. Now, this may persist for a somewhat prolonged period of time, giving rise to distention of the cells, with its train of symptoms already alluded to, which are watery or muco-purulent discharges, violent attacks of sneezing, headache, intra-orbital pressure, aprosexia, etc., and, if the constitutional habit be neurotic, hay-fever and asthma, these symptoms being simply exaggerated on the occurrence of more or less frequently repeated attacks of acute inflammation, to which the patient is liable.

The further course of this disease I take to be, in a certain small percentage of cases, the crowding out from the ethmoid cells, through the normal opening, of this myxomatous tissue, which presents in the nasal cavity in the form of small polypi. Not that I believe the large proportion of cases of nasal polypi have their origin in the ethmoidal cells, for Zuckerkandl has demonstrated conclusively that this is not the case. As the result of this inflammatory process within the cells, the thin walls become distended and we have a somewhat curious development by which the outer wall of the cells yields before the pressure, and we have the middle turbinated bone crowded outward, and gradually an extension of these cells into this body. And here for the first time there presents a condition by which we may recognize a morbid process in the ethmoid cells by ocular inspection through the nose; in other words, so far as rhinoscopic examination goes, in the inflammatory stage of the disease this distention of the cells and extension into the middle turbinated body gives rise to a protuberance into the middle meatus, which is easily recognized, the middle turbinated body presenting as a rounded, ovoid mass, usually in contact with the septum and encroaching notably upon the middle meatus of the nose. At the same time this curious myxomatous degeneration of the mucous membrane and lining cells conveys itself to the mucous membrane covering the outer wall, which is now the middle turbinated body in the nose, and lends additional aid in the recognition of the condition.

The next stage in the development of the disease consists in suppuration. The time of its development may be very early or very late in the history of the disease, this being governed somewhat by adventitious circumstances. The method of this development seems

very clear. The inflammatory process involving the membrane within the cells necessarily gives rise to hypersecretion, which materially contributes to the intracellular distention, and also results in a closure of the normal orifice. The consequence is the formation of an acute abscess, which, failing resolution, soon develops into a chronic abscess or chronic suppuration of the cells. We thus have established a chronic suppurative disease. The pus finds its exit through either the anterior or posterior ethmoidal cells; and I may state here, from a practical point of view, that the anatomical division of these cells into the anterior and posterior group is of no special interest to us in dealing with the diseased conditions, in that I believe they are really converted into a single group of cells, by either a normal or a rapidly established abnormal opening between the two. The pus makes its way into the nasal chambers through one of the normal openings, either in front into the hiatus semilunaris, or through the posterior opening into the superior meatus. Thus on ocular inspection we may find the pus making its appearance either from beneath the middle turbinated body or from between the middle turbinated body and the septum above. As a rule, the pus from the anterior and lower opening makes its way into the lower meatus and is expelled through the anterior nares, while the discharge from the posterior opening makes its way into the pharynx, giving rise to the symptoms so often complained of, viz.: that of dropping in the throat, in which way the disease may be confused with an ordinary naso-pharyngeal catarrh; although I should say here that the secretion of this latter disease is usually thick and adherent, and is expelled by somewhat violent nasal screatus, whereas dropping in the throat should always suggest the great probability of an empyema of either the ethmoidal cells or the sphenoidal sinus.

While the most natural exit for the pus is into the nasal cavity, this is by no means its invariable course, as is shown by the large number of cases in which the pus escapes through the os planum into the orbital cavity, giving rise to exophthalmos and orbital disease. Furthermore, we occasionally meet with exophthalmos from distention of the cells in the cavity, without escape of pus, as is still further and notably illustrated by the case reported by Bull, of ethmoidal suppuration, in which an artificial puncture through the orbit was followed later by a spontaneous rupture into the nasal cavities, the ultimate cure resulting probably from the latter.

As the result of the persistent suppuration, the lining membrane of these cells necessarily become soft and very much thinned. The much-discussed question of necrosis of bone never has interested me greatly, because I regard its importance as much overestimated.

That treatment should be instituted early in the history of the disease and before the suppurative process has ensued need not be urged, in view of the very serious discomfort and even danger which attends the stage of empyema, and the great difficulty with which it is brought under control after pus formation has become chronic. In acute ethmoiditis the ordinary measures which our text-books recommend in the treatment of acute rhinitis are indicated of course, and need not be dwelt upon, further than to say that of all measures I regard the use of the douche as most potent, and advise that from one to two gallons of water rendered thoroughly saline be passed through the nasal cavities by means of the Thudicum douche, at least twice daily. The water should be as hot as can be borne. This instrument I regard as devoid of danger to the ears, provided that the patency of each nostril be tested before its use and that the stream be made to pass into the narrowest naris, thus emerging without obstruction from the most patent side.

When the disease has reached the chronic stage without suppuration, I believe that, other measures failing, surgical interference should be resorted to in all cases, as we here have to deal with an affection which does not tend to undergo resolution, but one in which there is imminent danger of suppuration setting in at any time. The test that this chronic stage has been reached is to be found in the swollen and distended condition of the ethmoid cells, as shown by the projecting and swollen turbinated body, whether the mucous membrane covering it be in a state of myxomatous degeneration or simply turgescent. The object to be accomplished is to relieve intracellular pressure, and this is accomplished by uncapping, as it were the ethmoid cells. The steel-wire loop of the Jarvis or Bosworth snare is easily slipped over the projecting turbinated body, and the whole mass removed, presenting usually in the form of an elongated ovoid shell. This also reveals to us the condition of the mucous membrane within the ethmoid cells, which may be either in a simple state of turgescence, or, as has not infrequently happened in my own experience, a soft, gelatinous mass of myxomatous tissue is found filling the cavity thus opened. If this does not drop out of place, it is very easily removed by the mouse-tooth forceps or the snare.

After pus formation has occurred the problem before us, as before stated, consists in converting the large number of small cells which compose these bodies into a single cavity and establishing thorough drainage. In these cases the primary procedure is, as before, to uncap the cells by use of the snare, and after that I believe our best instrument is the dental burr. I have never been able to freely

manipulate the curette or the sharp spoon in the ethmoidal cells or to break down the trabecular walls by their use.

That this disease can be radically cured, or even modified or controlled to any great extent, by the use of disinfecting lotions, I do not believe. The small oval or round burr attached to the dental engine, or, better still, the De Vilbiss engine, in my hands has answered a better purpose than any other device. Manipulated with the De Vilbiss engine, it is made to enter the ethmoidal cells either before or after they have been uncapped, when the trabecular walls are easily broken down or burred away. Its motion can be instantly arrested at will, when it can be made to act as a probe, exploring the cavity for exposed bone or such parts as it is desired to remove. In this manner our operation becomes not only intelligent, but, I think, absolutely safe, a consideration which of course is to be very carefully borne in mind when we remember that not only are we separated in our operation from the orbit of the eye by an exceedingly thin plate of bone, but if we progress very far we are getting in close proximity to the base of the brain. In many of my cases the operations have been repeated a number of times at intervals varying from one week to a month, or even longer to secure thorough drainage. During the intervals of course the patient is directed to use disinfecting lotions with as much intelligence and thoroughness as can be accomplished by the ordinary devices which we place in the hands of our patients for use. I have no special suggestion to make as to the character of these lotions, as thoroughness of application is of more value than the special character of the antiseptic used. Moreover, it should be stated that the operation is not attended with anything like the pain that we should suppose when we consider the exceedingly sensitive character of the parts operated upon, provided that we can reach the parts in such a manner as to thoroughly saturate them with a cocaine solution.

Of 97 cases met with in my own practice, 3 were of carcinoma and 1 of sarcoma of the ethmoidal cells, which may be left out of consideration. As regards age, 3 occurred in the second decade of life, 14 in the third, 23 in the fourth, 28 in the fifth, 18 in the sixth, and 7 in the seventh decade. Sixty-one were males and 32 were females. Fifteen cases were inflammatory in character without suppuration or polypoid degeneration. Of these, 9 were cured, 3 were improved, and 3 disappeared. Twenty-nine cases showed myxomatous degeneration without suppuration. Of these 12 were cured, 10 improved, and 7 were seen but once or twice and their progress is not known. Twenty-two cases showed myxomatous degeneration or fully developed polypi together with pus discharge. Of

these, 9 were cured, 10 improved, and 3 disappeared. Of the purely suppurative cases there were 27, of which 8 were cured, 12 improved, both as regards subjective symptoms and the amount of discharge, while 7 were seen but once or twice and not further noted. In nearly all these cases radical operative measures were instituted, as carrying out the suggestions already made. In many of them the simple irrigating measures failed to give relief, either to subjective or objective symptoms, and the cells were opened either by the saw or drill. In many cases both were used.

Diseases of the Sphenoidal Sinuses.

Simple catarrhal inflammation of the mucous membrane lining the sinuses of the sphenoid bone occurs probably not infrequently as a complication of an acute rhinitis, as is the case with the other accessory sinuses. This, however, is not evidenced by any very marked symptoms, and it may undergo resolution, with the subsidence of the nasal disorder. Suppurative disease in this region, however, constitutes an affection of very serious import, in that, as in the other sinuses, it manifests but little disposition to undergo a spontaneous cure, but on the contrary, gradually extends to the deep layers of the membrane and the periosteum, resulting in a bony necrosis.

Etiology.—The course and development of this morbid process is much the same as we find it in the other accessory sinuses, and it probably arises primarily from obstruction of the ostium sphenoidale, resulting in a retention of secretion, with consequent suppurative inflammation. This obstruction may result from the encroachment of hypertrophic inflammation of the mucous membrane lining the nasal cavities, the existence of polypi or other tumors, the presence of foreign bodies, or some deformity of the nasal cavity, which acts to occlude the normal orifice. Zuckerkandl raises the question whether in certain cases the necrosis may not be primary, and the pus discharge a resultant symptom, although favoring the view that in the majority of instances the necrosis is the result of a morbid process in the mucous membrane. Purulent accumulations in these sinuses have been observed in connection with cerebro-spinal meningitis; and syphilis, scrofula, and facial erysipelas, with typhoid fever, have been given as causes of this disease.

Pathology.—The pathological changes which take place in the mucous membrane of these sinuses consist essentially in a catarrhal inflammation, gradually extending to the deeper tissues, which here constitute the periosteum, as the result of which the nutrition of

bone is so far interfered with that necrosis occurs, the simple catarrhal inflammation being converted into a suppurative process, as the result of obstruction to the orifice and resultant accumulation of the secretions. Hence, we can easily see how the anatomical situation of the orifices of the sphenoidal sinuses and the antrum favor the development of suppurative inflammation, being situated on the lateral wall of the sinus, thus differing from the ethmoidal and frontal sinuses, whose orifices admit of freer drainage, while Zuckerkandl singles out the ostium sphenoidale as being located in a manner particularly unfavorable to the free escape of accumulated secretions.

Symptomatology.—More or less profuse purulent discharge from the nasal cavity is a prominent symptom of the disease, this pus being the same bright yellow healthy pus which is characteristic of suppurative disease of all of the accessory sinuses. The discharge makes its way backward, as a rule, dropping into the pharynx. Lennox Browne makes the statement that "sphenoidal discharges may be the forerunner and possibly the excitant of obstinate post-nasal catarrh." This is scarcely a correct observation. Certainly the discharge excites no morbid condition in the mucous membrane over which it passes, and, moreover, a pus secretion does not occur in what is ordinarily termed a post-nasal catarrh. Deep-seated pain is always present, referable to the side affected, and in some cases may be of a most distressing character, radiating through the whole side of the face and involving all the branches of the trigeminus. Owing to the proximity of the sphenoidal sinuses to the optic foramina, ocular symptoms may naturally be expected, and hence impairment of vision or complete blindness may occur, as the result of pressure on the optic nerve. The notable symptoms are a pus discharge with pain, followed, as the disease progresses, by a somewhat sudden occurrence of blindness, and in a certain proportion of cases the development of orbital abscess, or serous exudation into the cellular tissue of the orbit.

Berger calls attention to a peculiar feature of the amaurosis occurring in connection with cases of sphenoidal disease, in that the peripheral field of vision is invaded before the central field is affected. This is explained by the fact, as first observed by Samelsohn, that the central fibres of the optic nerve are distributed to the macula lutea, while the peripheral fibres are distributed to the outer portion of the retina.

Diagnosis.—A diagnosis of suppurative disease of one of the accessory sinuses having been established by the existence of a discharge of bright yellow healthy pus from one of the nasal passages, the attention would necessarily be directed toward the sphenoidal

sinus as the seat of the disease, by the fact of the pus pouring over the surface of the middle turbinated bone, and because its source can be traced to the superior meatus, provided the nasal passages are sufficiently patulous to admit of a thorough exploration. It should be stated, however, that this nice localization of a purulent discharge in this region is very rarely possible by an examination anteriorly, although it may occasionally be accomplished by posterior rhinoscopy. In those cases of ethmoidal disease in which the posterior group of cells is involved, we may also have a pus discharge into the superior meatus. In these cases, the recognition of the disease will necessarily be based on a consideration of concomitant symptoms, although it should be stated that probably, in the majority of cases in which the posterior group of ethmoidal cells is the seat of the disease, the sphenoidal sinuses are involved in the same morbid process, owing to their close anatomical relation and to the fact that the orifices both of the sphenoidal and posterior ethmoidal cells open together into the superior meatus, and hence the same causes which would operate to produce suppurative disease in one group would act equally in the other. The pus discharge makes its way into the pharynx, giving rise to symptoms of ordinary so-called naso-pharyngeal catarrh, although the character of the secretion differs essentially from the ordinary inspissated mucus which is found in the pharyngeal vault in that disease. Suppurative inflammation of the pharyngeal bursa, the so-called Tornwaldt's disease, gives rise to a pus discharge into the pharyngeal vault. This affection, however, I regard as an exceedingly rare one, and, furthermore, a rhinoscopic examination should easily establish the source of the purulent secretion. Ziem has reported a rather interesting case, in which a somewhat profuse purulent discharge into both the pharyngeal vault and the nasal cavities had its origin in a cyst of the pharyngeal bursa, the removal of which seemed for a while to arrest the disease, although subsequently it became necessary to open the antrum, on account of suppurative inflammation of that cavity. Further diagnostic signs pointing to sphenoidal disease consist of deep-seated pain, exophthalmos, paralysis of the optic nerve, or paresis of any of the motor nerves passing through the sphenoidal fissure. The deep-seated pain is characteristic both of sphenoidal and ethmoidal disease, and presents no points especially indicative of either affection. Exophthalmos is present in a large proportion of cases, but is probably not so constant a symptom of this affection as of ethmoidal disease. One of the earliest effects of distention of the sphenoidal sinus by pus would be pressure on the optic nerve, in its passage through the optic foramen; hence the sudden onset of amaurosis occurs in probably a large pro-

portion of cases. An examination by the ophthalmoscope in these cases should reveal the characteristic swollen disc. Still further diagnostic indications are furnished by the results of pressure on the nerves passing through the sphenoidal fissure, causing ptosis, strabismus, or immobility of the eyeball.

Course and Prognosis.—The prognosis of these cases, as a rule, is grave, as, owing to the depth and inaccessibility of the parts affected, and the difficulty of reaching them with proper remedial measures, suppurative inflammation sooner or later leads to a necrosis of bone, which, extending slowly, invades the orbital cavity, producing paralysis of the optic nerve. Death may occur as the result of meningitis or as the result of invasion of the cavernous sinus by an erosion of its wall, as in a case reported by Scholz, in which the primary seat of the disease was in the sphenoidal cells. Cases of thrombosis of the circular and cavernous sinus and of the ophthalmic veins have occurred. A somewhat unique case is reported by Baratoux, in which nature effected a cure by the spontaneous expulsion of the whole body of the sphenoid through the nose, the singular feature of the case being that during the course of the disease there were no symptoms of meningeal irritation nor impairment of vision.

Treatment.—The same palliative measures are indicated here as noted in the directions for treatment of ethmoidal and antral disease. These consist in the use of cleansing and disinfecting sprays and washes, together with politzerization, either anteriorly or posteriorly according to Ziem's method. These should be used frequently and with all thoroughness, in order to secure as efficient drainage of the diseased cavity as is possible in this manner. The indications for the radical treatment of the disease consist simply in opening the cavity for the discharge of pus in its early stages, and the removal of necrosed bone, when feasible, in its later development. Zuckerkandl advises the opening of the sphenoidal sinus through the nasal cavity, at its anterior and dependent portion, whereby the most efficient drainage may be secured. He directs that a trocar shall be introduced along the septum, passing upward and backward, across the middle turbinated bone, about at the junction of its posterior and middle third, until it reaches the anterior wall of the sphenoid cells, when it is pushed directly into the cavity. Zuckerkandl's advice is based entirely on anatomical study of the cadaver. This operation demands great manipulative dexterity and great care, as there is some risk of entering the cranial cavity. After an opening has been established, the further treatment of the disease consists in daily washing out the cavity, by means of cleansing and disinfecting lotions, while at the same time the patency of the orifice is maintained by proper means.

If bony necrosis is found to exist, it should be removed so far as possible, under the general rules of ordinary surgical procedure. If this is limited in extent, a small curette through the artificial opening would probably accomplish all that is required. If, however, the necrosis has extended to the body and wing of the sphenoid, its removal can be accomplished only by access through the orbit.

Disease of the Frontal Sinuses.

While simple catarrhal inflammation of the mucous membrane of the frontal sinuses occurs in connection with a cold in the head more frequently than that of any of the other accessory cavities, suppurative inflammation, on the other hand, is one of the rarest occurrences. This is probably due to the fact that the infundibulum opens from the most dependent portion of the cavity, thus affording free drainage, while, at the same time, it is probably less liable to become firmly occluded. We find, then, here an accessory sinus, in which the anatomical conditions favoring the development of suppurative disease are absent. Thus, Zuckerkandl states that he has never met with a single instance of uncomplicated disease of this sinus.

Etiology.—The disease may arise as the result of any condition causing occlusion of the orifice of the sinus, such as hypertrophic rhinitis, deflection of the septum, the presence of tumors in the nasal cavity, or any other obstructive lesion in the nasal passages. This, however, is an exceedingly rare event. Far more active agents in the production of the disease are traumatism, maggots in the nose, gonorrhœa, syphilis, scrofula, disease of the ethmoidal sinus, or the development of tumors within the sinus itself.

Pathology.—The changes which take place in the membrane consist briefly in hyperæmia, with hypersecretion, which, as the result of retention, gradually changes into a suppurative process, and in connection with this the morbid process gradually invades the whole thickness of the mucous membrane, causing marked tumefaction with resultant periostitis and the development of exostoses or bony plates. In fact, the pathology of disease of the frontal sinus differs in no respect from that of disease of the antrum already described.

Symptomatology.—The earliest symptom, which should direct attention to a diseased condition of these sinuses, is frontal headache, which may develop into pain of an exceedingly distressing character, increasing as the accumulated secretions gather and distend the sinus. A certain amount of relief is gained with the escape of pus, which, flowing into the nasal cavity, is discharged through the nose. It is bright yellow, and at first is exceedingly offensive in character. As

the flow becomes established, however, the fetor in a measure disappears. The headache is usually persistent, although occasionally it may assume an intermittent type. It is increased by mental effort, or by the use of alcohol, and at times assumes the character of sick headache, being attended with nausea and vomiting. If the pus accumulation in the sinus is large and its exit obstructed, the roof of the orbit may be so far crowded downward as to produce displacement of the eyeball with diplopia or amaurosis. At the same time, the anterior wall of the cavity may be so far displaced as to produce notable facial deformity. If the posterior wall of the sinus is displaced, it will be indicated by symptoms referable to the brain, such as dulness or apathy, with increased headache, or sleepiness. The brain symptoms, however, are very apt to be obscure, as is usually the case when pressure occurs on the anterior lobes, although Otto, as quoted by Schech, cites a case in which displacement of the posterior wall of the sinus gave rise to unilateral paralysis. If the disease goes on so far as to produce erosion of the posterior wall, with the escape of pus into the brain cavity, the ordinary symptoms of meningitis supervene; on the other hand, a cerebral abscess may develop without perforation of the bony wall of the sinus. In the same way, erosion of the roof of the orbit may occur, resulting in the escape of pus and the development of an abscess in this cavity. In this connection it should be borne in mind that a congenital defect occasionally occurs in the development of the bones of the orbit, by which a permanent opening exists in this plate, through which pus from the frontal sinus may make its way into the orbital cavity, without erosion or necrosis.

Diagnosis.—The history of the case will often afford diagnostic points, leading to the suspicion of the existence of frontal disease, as gonorrhœa, maggots, syphilis, etc. The pus discharge presents the ordinary characteristics of disease of the accessory sinuses, and makes its appearance in the nasal cavity as a bright yellow healthy pus flowing over the middle turbinated bone, rather nearer the anterior extremity; it is discharged usually through the nostril. In connection with this the diagnosis usually should be fairly well established, by the existence of frontal pain, tenderness upon pressure, possible dulness on percussion, as compared with the opposite side, and, if distention occurs, the gross evidences of the disease as shown by external deformity or displacement of the orbital plate.

Prognosis.—Simple catarrhal inflammation of the frontal sinus usually undergoes resolution spontaneously. In suppurative disease this tendency is not remarkable, and, although the prognosis is rarely grave when the disease is uncomplicated, its course is somewhat lengthened and tedious unless arrested by proper remedial measures.

Its tendency is not toward the development of necrosis, but to the accumulation of pus in the sinus, with distention and encroachment upon neighboring cavities.

In two cases reported by Pettesohn, nasal discharge had been a symptom for some time. There was a tumor at the supranasal angle of the orbit and œdema of the upper lid. Both patients were cured by incision.

Treatment.—The primary treatment of the affection consists in the use of cleansing disinfectant lotions in the nasal cavity by means of the syringe or atomizer, in order to remove such secretions as may lodge in this region, and at the same time establish, so far as possible, free drainage through the normal opening. This, however, in many cases fails to accomplish all that is desired, and hence it becomes necessary to make an artificial opening into the sinus through the bony walls, of sufficient size and accessibility to admit of their thorough cleansing, and at the same time secure free drainage. The point usually selected for this operation is immediately below the eyebrow and near the bridge of the nose; an incision having been made through the integument, the periosteum is elevated, and subsequently the perforation made into the frontal sinus by means of a drill, trocar, or trephine. In this manner the opening is made as nearly as possible in the dependent portion of the cavity. When an orbital abscess exists, of course the first indication is to open this by free incision, after which an exploration with a probe could reveal, in most cases, an already existing perforation of the orbital plate, and in those rare instances in which no opening exists here the bone will be found to be in a condition which will easily permit of perforation. The opening must be made sufficiently large to give free access to the sinus. It would seem that, even when no orbital abscess exists, we have at the upper and inner angle of the orbit, just within the supra-orbital ridge, a site which might well be chosen for an artificial opening, in that the bony plate is quite thin, and while the cavity could be surely and thoroughly opened, the resulting cicatrix would be less noticeable. When the infundibulum is obstructed, it is a matter of considerable importance, even after the artificial opening into the frontal sinus has been established, to reopen also the normal orifice, in order that proper through-and-through drainage may be secured. Schech advises the dilatation of the normal orifice by means of a probe passed through the artificial passage resulting from opening the frontal sinus, and if necessary the forcible passage of a trocar through into the nasal cavity and the insertion of a drainage tube into the opening thus made. Such a procedure, however, would rarely be necessary. After access has been gained to the sinus, thorough ex-

ploration should be made with a probe, which should reveal the presence of necrosis or tumors, and, furthermore, would make known the involvement of the neighboring sinuses if such exist.

In some cases it would seem that the disease may be cured by the removal of such obstructing lesion as may be found in the nasal cavity; thus Schmiegelow has reported a case of suppurative disease of the frontal sinuses cured by the removal of nasal polypi. Seiss goes so far as to state that in the majority of cases the disease can be controlled by "pinning down" the swollen tissues in the nasal cavity which occlude the normal orifice, using applications of chromic acid, after the manner described in Chapter IX. While not indorsing so broad a statement, I am disposed to think that much can be accomplished by measures of this character; as stated in discussing the subject of disease of the antrum, I believe that suppurative disease is set up in this cavity as the result of a morbid process in the nasal cavity far more frequently than in any of the other accessory sinuses.

Differential Diagnosis between Disease of the Accessory Cavities.

While the recognition of suppurative disease of one of the accessory sinuses of the nose is comparatively an easy matter, the determination of which cavity is affected is often involved in considerable obscurity, and hence it would seem not out of place to group together here the different symptoms, with their special diagnostic significance.

A pus discharge from the nose is characteristic of diseases of all the sinuses, excluding those exceptional cases in which the normal orifice is completely occluded, in which event the abscess is forced, as it were, into neighboring regions, such as the orbital or cranial cavity. In antral and frontal disease, and in disease of the anterior ethmoidal cells, the pus makes its way anteriorly and is discharged from the nostril, while in disease of the posterior ethmoidal and the sphenoidal sinuses, it makes its way into the pharnyx. In antral disease, the discharge is intermittent, and shows a certain degree of periodicity. In disease of the other cavities it is usually continuous. Inclining the head well forward, or lying on the unaffected side, favors a discharge from the antrum, while the upright position favors a discharge from the other sinuses.

Unilateral pain is present in all the affections. In antral diseases, this is most marked in the region of the cheekbone and teeth. In frontal disease, it becomes a frontal headache, while in the ethmoidal

and sphenoidal affections it is more deep-seated, and locates itself at the roof of the orbit.

Exophthalmos is the rule in ethmoidal disease, but is also met with somewhat frequently in connection with disease of the sphenoidal sinuses. It is exceedingly rare in connection with disease of the antrum, and occurs only when the abscess ruptures into the orbit. In frontal disease bulging of the orbital plates is not a rare event, but in this case the eye is apt to be crowded downward and outward, so that the eyeball is not protruded to the same extent as is liable to occur in ethmoidal disease. Diplopia, when present, is the result of displacement of the eyeball, and therefore constitutes a diagnostic sign of no additional value.

Sudden blindness is due to pressure on the optic nerve as it passes through the optic foramen, and is, therefore, met with only as a symptom in connection with sphenoidal disease; although, as Ziem has shown, the field of vision may be narrowed in disease of the antrum.

Ptosis is the result of pressure on the third nerve as it passes through the sphenoidal fissure. This also, therefore, would point to involvement of the sphenoidal labyrinth.

Strabismus would be occasioned by a certain differentiation of the pressure on the nerves passing through the sphenoidal fissure, and would also indicate the existence of sphenoidal disease.

Facial neuralgia may occur in connection with disease of any of the sinuses, although it is most constantly met with in disease of the antrum, less frequently in connection with sphenoidal disease, and with the greatest rarity in connection with ethmoidal and frontal disease.

Fetor is present in a very mild degree in disease of all the sinuses, and may possess a certain amount of intermittency as suggested by Luc, thus pointing more directly to disease of the antrum, in that the fetor probably attends the escape of pus after a temporary retention.

The frequency with which the different sinuses are affected by suppurative disease affords a certain amount of aid in diagnosis. Antral disease is by far the most frequently met with, while in the order stated the disease is less frequent in the ethmoid and sphenoid sinuses, while suppurative disease of the frontal sinus is the rarest of all.

SECTION II.

DISEASES OF THE NASO-PHARYNX.

DISEASES OF THE NASO-PHARYNX.

CHAPTER XXXIX.

THE ANATOMY AND PHYSIOLOGY OF THE NASO-PHARYNX.

In our consideration of the subject I prefer the use of the term naso-pharynx as clearly defining that space which lies behind the posterior nares and the oral cavity, and which has been described.

Anatomy of the Naso-Pharynx.

This cavity consists of a quadrilateral space, lying behind the posterior nares, and bounded as follows: Its roof is formed by the basilar process of the occipital bone, together with a small part of the posterior portion of the body of the sphenoid, while it terminates below in an imaginary plane opposite the border of the palate. The posterior wall is formed by the spinal column, the prominence of the arch of the atlas being often recognized at about the point where the vertex of the palatal arch in contraction impinges upon the pharyngeal wall. From this upward, the wall curves forward. The anterior boundary is formed by the two oval openings of the posterior nares, together with the posterior border of the vomer or septum, which presents a somewhat sharp edge below at its articulation with the hard palate, but expands somewhat above, to articulate with the rostrum of the sphenoid. Each lateral wall is marked by the opening of the pharyngeal orifice of the Eustachian tube, which presents as a somewhat elongated or ovoid funnel-shaped orifice. The opening of the tube is partially surrounded by a well-defined cartilaginous ridge, which is mainly formed by a projection of the cartilage which enters into the formation of the tube proper. This eminence is very well marked posteriorly and above, while anteriorly it is less prominent, and immediately below the orifice it is absent. As the mucous mem-

brane is reflected over this cartilaginous ridge or cushion of the Eustachian orifice, as it is usually termed, it is thrown into a fold, as it passes from the lower termination of the posterior section of the ridge to the pharynx below, forming what has been designated by Luschka as the plica salpingo-pharyngea, while by its reflection from the anterior portion of the ridge a less prominent fold is formed, which extends from the anterior border of the tube to the soft palate. This is called by Luschka the plica salpingo-palatina. Immediately behind the Eustachian orifice, and lying between the cartilaginous cushion and the posterior wall of the pharynx, is noticed an elongated depression, the fossa of Rosenmüller. This fossa varies somewhat in shape and depth in different subjects, although it is usually elongated, and much broader above than below, and is mainly of interest in that in introducing a Eustachian catheter, its point is usually first engaged in this depression. While at rest the Eustachian orifice is closed, and is opened only as the result of muscular contraction in the various functional movements of the fauces.

The muscle which acts most prominently as a dilator of the tube is the tensor palati muscle, or, as it is generally named by otologists, the spheno-salpingo-staphylinus, or the dilator tubæ. It arises from the base of the internal pterygoid plate of the sphenoid bone and the scaphoid fossa, and from the cartilaginous portion of the Eustachian tube throughout its whole length. It then passes downward, forward, and inward, and winds around the hamular process of the sphenoid, and is inserted into the soft palate. It enlarges the calibre of the tube by drawing its anterior cartilaginous margin downward and forward.

The levator palati, whose action is less marked than the action of the former in opening the Eustachian tube, and yet undoubtedly possesses a certain function in this direction, is a long, rounded, muscle, arising from the petrous portion of the temporal bone, and from the cartilaginous portion of the tube, from which, passing downward and inward, it spreads out into a broad tendon, and is inserted with its fellow into the median line of the soft palate, the fibres blending with the mucous membrane of this structure. By its contraction it lifts, as it were, the lower edge of the collapsed tube into such a position that its lateral walls separate, and the lumen becomes patulous.

The palato-pharyngeus, which arises from the soft palate, the posterior portion of the hard palate, and from the cartilaginous portion of the Eustachian tube, passes downward to the thyroid cartilage, some of the fibres blending with the corresponding muscle of the opposite side. Its action is to fix the cartilaginous portion of the tube to which it is attached, and thus aid the action of the levator palati.

The orifice of the Eustachian tube is usually described as opening into the anterior and lower portion of the lateral wall of the naso-pharynx, opposite the posterior termination of the lower turbinated bone, from which it is distant about three-eighths of an inch, while its average distance from the nostril is from two and three-quarter inches to three and one-fifth inches. Kostonecki, however, has shown that there are very great variations in the locality of this orifice, as regards its vertical position, in that in many cases it is found much higher in the lateral wall of the pharynx than in others. This fact, however, is constantly brought to the notice of otologists in passing the Eustachian catheter, for in many cases the tip must be carried well upward, in order to engage in the tubal orifice.

The cavity of the upper pharynx differs greatly in different individuals, without reference to their physical development. Luschka's measurements, however, are as follows: its vertical and antero-posterior measurements are about the same, viz., three-quarters of an inch, while its width is about one and three-eighth inches.

The fibrous basement structure of the naso-pharynx consists of a thick aponeurosis, which has its attachment to the basilar process of the occipital bone and the petrous portion of the temporal. Beneath this tissue are found certain muscular structures involved in the movements and support of the head. Its internal surface is lined with mucous membrane, which differs in no essential features from the mucous membrane of the respiratory tract. It is richly endowed with mucous glands, of both the tubular and racemose varieties, while its epithelial surface is covered with columnar ciliated epithelium.

The feature, however, which gives the pharyngeal vault an especial interest, and also endows it with certain important functions, is the crowding together of a large number of glands into a distinct mass, in the upper and central portion of the cavity, constituting what is known as the pharyngeal tonsil, or the third tonsil, and sometimes called Luschka's tonsil. According to Luschka, there is always present in this region, although in varying degrees of development, a soft mass of tissue, of about one-quarter of an inch in thickness, spread over the roof and posterior wall of the naso-pharynx, covering the whole extent of the basilar process of the occipital bone. It extends the whole width of the pharynx, to the fossæ of Rosenmüller, and even encroaches upon the cartilaginous eminences surrounding the Eustachian tube. The gross appearance of this mass of glands varies somewhat, presenting occasionally a soft cushion-like outline covered with small rounded elevations, while in others it is traversed by fissures in various directions. The most constant appearance, how-

ever, and that seen in the largest majority of cases, is that in which the mass is traversed longitudinally by a series of fissures or indentations, of perhaps a quarter of an inch in depth, with a slight disposition to branch, as it were, giving rise to a sort of crow's foot appearance on the surface. (See Figs. 50, 51.) At the lower portion of the pharyngeal tonsil, in the median line, Luschka describes an opening, about the size of the head of a pin, sometimes larger, sometimes smaller. This opening leads into a small sac, about three-quarters of an inch long and a quarter of an inch wide, to which Luschka gave the name bursa pharyngea. Ganghofner and Schwabach deny its existence as a distinct anatomical structure, taking the ground that this bursa, so-called, is really the recessus pharyngeus medius, or simply the median fissure of a normal pharnygeal tonsil, or possibly an hypertrophied one, which, undergoing the changes incident upon maturity, has by a process of unfolding, as it were, or shrinking up upon the median line, resulted in an adhesion of the superficial layers of the adenoid tissue over the median fissure, in such a way as to form this bursa-like cavity.

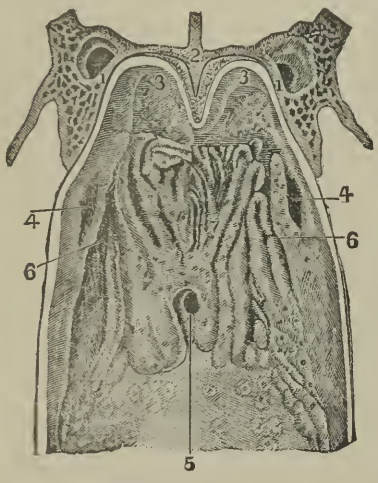

FIG. 50.—The Glandular Structures at the Vault of the Pharynx. (Luschka.) 1, 1, Pterygoid processes; 2, vomer; 3, posterior portion of the vault of the nasal fossæ; 4, 4, Eustachian tubes; 5, orifice of the bursa pharyngea: 6, 6, Rosenmüller's fossæ; 7, median folds formed by the glandular tissues.

FIG. 51.—Glandular Structures of the Pharyngeal Vault, seen in Antero-posterior Section.

This region derives its arterial supply from the ascending pharyngeal branch of the external carotid, and the ascending palatine branch of the facial, together with the palatine and the sphenopalatine branches of the internal maxillary. The veins open into the internal jugular. The nerve supply is derived mainly from the second division of the fifth pair, together with branches from the glosso-pharyngeal and vagus.

Physiology of the Naso-Pharynx.

While the naso-pharynx is situated apparently in the continuity of the respiratory tract, and furthermore its mucous membrane shows the anatomical characteristics of the mucous membrane lining the respiratory tract, namely, in the fact that it is covered with columnar ciliated epithelium, yet I am disposed to think that the function of the naso-pharynx has mainly to do with the food tract. The lower pharynx is very sparsely endowed with glandular structures. It is lined by a hard, dense membrane, fitted eminently to permit without injury the passage of harsh and oftentimes irritating particles of food, but it is endowed with a very scanty secreting apparatus. The glands necessary to furnish this region with a proper lubricant, were they embedded in the tissue of the lower pharynx, would be exceedingly liable to injury, from the constant irritation of food in the act of deglutition. Hence, we find them removed to the well-protected recess found between the two pillars of the fauces, where they form the faucial tonsils, and to the still better protected recess, the vault of the pharynx. In these three regions we find masses of glands, which pour out large quantities of mucus, whose sole and only function is to thoroughly lubricate the bolus of food and facilitate its passage down into the œsophagus.

The normal secretion from the pharyngeal tonsil consists of an absolutely clear, transparent, somewhat viscous mucus, of the appearance and consistency of the white of an egg. The pharyngeal vault being, adventitiously as it were, a part of the air tract, it is of course endowed with certain anatomical features characteristic of the air passages.

The function of this region as a resonant chamber for the voice, and in connection with the auditory apparatus, will more properly be discussed in other chapters.

CHAPTER XL.

ACUTE NASO-PHARYNGITIS.

The disease consists essentially in an acute inflammation of the mucous membrane lining the vault of the pharynx.

Etiology.—Exposure to cold we regard as the prominent exciting cause of all acute inflammatory processes involving the mucous membrane of the upper air passages. Aside from this, I know of no cause for the disease.

It is met with much more frequently in adult life than in youth. An ordinary cold, as we call it, in very young children occurs usually in connection with adenoid disease of the pharyngeal vault, or with the purulent rhinitis of childhood. This tendency disappears at puberty or perhaps before, after which an exposure results more commonly in an ordinary acute rhinitis, or a typical cold in the head.

As a secondary result of the morbid process in the nasal passages, the naso-pharynx becomes involved. In other words, chronic inflammatory processes tend to pass downward in the air passages, carrying with them the tendency to recurrent attacks of acute inflammation. Aside from these considerations, the predisposing causes of the disease will be more particularly discussed in the consideration of the general subject of naso-pharyngeal catarrh, in another chapter.

Symptomatology.—The attack comes on somewhat suddenly, as the result of exposure, and usually is marked by notable constitutional disturbance, a flushed skin, headache, loss of appetite, etc. The thermometer may indicate a temperature not over perhaps 100° to 101° F., and yet there is frequently a malaise and feeling of illness and prostration, which compels a patient to confine himself to his room or bed.

One of the earlier sensations is a feeling of burning or dryness, referable to the back of the throat; this is due to the abnormal dryness of the membrane, which, as we know, characterizes the first stage of all acute inflammatory processes in the upper air passages. This stage will often last two, three, or even four days. In connection with this, as indicating a close connection between the naso-pharynx and the digestive apparatus, there is liable to be a torpid

condition of the bowels, or even obstinate constipation, with complete anorexia and a tendency to nausea.

The second stage of the attack is characterized by a more or less profuse muco-purulent discharge. This secretion consists of a somewhat thick, grayish, opaque mucus, which is voided in considerable quantities. The setting in of the secretion seems, to an extent, to aggravate the gastric disturbance, especially giving rise to a tendency to nausea or vomiting, the appetite being, at the same time, considerably impaired.

The third and last stage of the disease consists of a gradual letting up of the subjective symptoms and a diminution of the discharge. The voice is affected very early in the attack, and in a somewhat peculiar manner, which is almost characteristic of this form of cold, in that it has a curious, hoarse, metallic ring to it, which weakens the tone, although it is never entirely lost. Pain is always a prominent feature of this form of cold during all stages of the attack. This is usually referable to the roof of the mouth, or upper portion of the throat, from which point it seems to radiate toward the angles of the jaw, and may even extend up to one or both angles of the face, giving rise to a facial neuralgia. Certainly it occurs frequently in women of a nervous and perhaps hysterical temperament. Pain in the back of the neck is also prominent in these cases, which consists of a stiffness or soreness in the large muscles, rather than in a neuralgic pain. Cough is rarely met with, although a more or less disagreeable sense of itching or scratching about the fauces is liable to be a prominent source of complaint. Furthermore, the disease does not show any marked tendency to extend down into the trachea and bronchial tubes, although it almost invariably involves the lower pharynx. When we consider that the mucous membrane of the upper and lower pharynx is involved in the acute inflammation, we can easily understand how symptoms referable to the ear should, in most cases, be a prominent characteristic. In the first, or dry stage, we find frequently that the Eustachian tubes are closed, as evidenced by the fact that the patient hears his own voice with a distinctness which may be almost a source of distress. This symptom, however, of autophonia usually disappears with the setting in of the secretion.

Diagnosis.—The diagnosis offers no difficulty. We should, however, be careful to look for any follicular inflammation. This, of course, should be determined by the fact that in the exudative form of the disease there is a lack of the mucous secretion, while at the same time the characteristic white spots, marking the existence of a croupous exudation in the crypts of the follicles, are absent. Of course, this last point is only fully determined after a thorough cleansing

of the pharyngeal vault by means of a spray through the nose, or by a post-nasal syringe. Moreover, the latter disease, it should be borne in mind, is accompanied, especially in its earliest stages, by a temperature of from 101° to 103°, while in the catarrhal form of inflammation, the temperature rarely exceeds 100° F.

Prognosis.—These attacks involve no special danger to life, although they run a somewhat prolonged course, during which time the patient suffers from the exceeding discomfort. The disease, however, shows no marked tendency to extend to the passages below and generally terminates in complete resolution, or, if the patient has previously suffered from naso-pharyngeal catarrh, it simply leaves behind a somewhat aggravated form of the chronic disease. Mackenzie who alludes very casually to this affection, and Sajous, who devotes a chapter to its consideration, seem to suggest that the acute form of the disease may degenerate into the chronic. It might be stated, in this connection, that the above writers, so far as I know, are the only ones who refer to this form of a cold.

Treatment.—At the onset of the attack, the effort should be made to break up the cold, in much the same way as we try to abort an attack of acute rhinitis. For this purpose we may give ten grains of quinine; at the same time diaphoresis should be produced.

We should bear in mind the intimate relation between the pharyngeal structures and the digestive apparatus. A full dose of calomel or blue mass should be given with the quinine at bedtime, to be followed in the morning (and each morning during the existence of the cold) by a glass of Kissingen, Geyser, or Congress water. If headache is a prominent symptom, perhaps we have no better remedy than antipyrin in doses of ten grains, to be repeated every hour, until relief is obtained. Pain is always a prominent symptom, and for its relief some preparation of aconite should be given, and of these none is so prompt in its action as the alkaloid aconitia, administered in the form of the tablet triturates or in granules (Duquesnel's preparation) in doses of $_5\frac{1}{0\,0}$ of a grain every hour, in the case of a male, and every two hours, in that of a female, until the pain is relieved, or the constitutional effect of the drug is manifested, as shown by numbness and tingling about the fauces or lips, vertigo, or faintness. In administering this remedy considerable care must be exercised, and when it is impossible to see a patient soon I have usually directed the drug in the above doses, to be taken every hour for three hours during the early morning, the same process being repeated in the early afternoon, and again in the evening if necessary.

The best local application in this disease is a strong solution of

cocaine, for depleting the blood-vessels, after which, an application of chromic acid should be made after the manner already described for the treatment of hypertrophic rhinitis. This application will not only exercise a beneficial effect on the inflammatory process in the naso-pharynx, during the first stage, but will also serve to modify the nasal hyperæmia which complicates the attack. As soon as the stage of secretion sets in, applications to the primary seat of the attack in the pharyngeal vault are always grateful and afford a certain amount of relief. For this purpose, the ordinary nasal douche, with water as hot as can be borne (which is made saline by the addition of common salt), is of no little value, or the post-nasal pipe in connection with the nasal douche is, perhaps, still better. This may be repeated as often as three or four times a day. Snuffs and powders are of but little service in this form of disease, and may even be a source of annoyance.

CHAPTER XLI.

NASO-PHARYNGEAL CATARRH.

This is a term used to designate a disease characterized by an excessive secretion of mucus or muco-pus from the glandular structures of the vault of the pharyynx, and which, passing down behind the palate, diffuses itself over the lower pharynx, where it gives rise to more or less irritation, and excites a constant hawking and expectoration in connection with an annoying nasal screatus. Many and various have been the opinions advanced as to the causation and locality of this affection; the position which from the evidence we are compelled to take upon the matter is that naso-pharyngeal catarrh is undoubtedly, in many cases, due to a diseased condition of the so-called bursa pharyngea (as Tornwaldt claimed), but it seems to me entirely too narrow a view of the case to say that all cases of naso-pharyngeal catarrh are dependent on the existence of a bursal cavity. Wherever we have muciparous glands gathered together in large masses, we have an anatomical condition which predisposes the part to a chronic inflammatory disease, in which the prominent lesion consists in cell desquamation, in connection with an apparent increased mucous secretion, and I think we are bound to accept the view that we may also have the same morbid condition existing in the glandular structures of the pharyngeal vault. A chronic inflammatory process involving these glands, and attended with a moderate amount of diffuse hyperplasia, may result, then, in a muco-purulent discharge from the broad, evenly distributed cushion of glandular structure spread over the pharyngeal vault, or the hyperplasia may take such a form as to give rise to the bursa-like cavity of Luschka or Tornwaldt. The formation of the bursa is a somewhat adventitious incident of the morbid changes which take place in the tissue, thus adding an entirely new condition, which serves to prolong, and possibly aggravate, the catarrhal affection.

Etiology.—Inflammatory changes in the mucous membrane of young people show a marked tendency to invade the lymphatic structures, while in adults it is the connective-tissue structures which are more especially involved. Following this rule, I think we must

look for the primary source of naso-pharyngeal disease to the earlier period of life. An inflammatory process in children, involving the pharyngeal vault, gives rise to a hypertrophy of the pharyngeal tonsil, or so-called adenoid disease. Hence, it is altogether possible that, in many cases, an enlarged pharyngeal tonsil in childhood leads to the development, in adult life, of one of the forms of naso-pharyngeal catarrh heretofore described. In these cases we undoubtedly find an active exciting cause in some one of the exanthems, especially scarlet fever or measles. After its onset, I think the disease should be regarded in all cases as a purely local condition and not dependent on any general dyscrasia, although Beverley Robinson lays special emphasis on the fact that the disease is due not alone to a catarrhal diathesis but it may be and frequently is attached to the "gouty, hepatic, syphilitic, scrofulous, and tuberculous diatheses, and a malarial influence may likewise be evident," while Moure also gives the first place to the strumous diathesis as the cause of the disease. Lennox Browne, on the other hand, while making the statement in his first edition that patients suffering from naso-pharyngeal catarrh are generally scrofulous, seems to have abandoned this view entirely in his second edition.

As regards taking cold, I am disposed to think that in most instances the chronic inflammatory process exists first, and that this renders the patient susceptible to atmospheric changes, and that repeated colds become a symptom of the chronic inflammation rather than that chronic inflammation results from the repeated colds.

The use of tobacco is supposed by some to be a cause of pharyngeal catarrh. This is not based, I think, on careful clinical observation. The effect of tobacco smoke is to aggravate temporarily, and perhaps permanently, an existing catarrhal lesion, while its causative influence in the primary production of the inflammatory process in the naso-pharynx is very limited.

The use of alcohol, on the other hand, is undoubtedly a prolific source of naso-pharyngeal catarrh.

By far the most frequent and most potent of all causes which lead to the development of a naso-pharyngeal catarrh is a diseased condition of the mucous membrane lining the nasal passages proper. In the chapter on the physiology of the nose, the intricate and exceedingly important respiratory function of the turbinated bodies was discussed at considerable length, and an important feature of that discussion consisted in the assertion that the integrity of the mucous membrane of the whole upper air tract was directly dependent upon a healthy condition of the respiratory function of the nasal mucous membrane. If, then, we have a chronic inflammation, with hyper-

trophy of the nasal membrane, interfering with the normal nasal respiration, and hampering the normal process of serous exosmosis, the very first portion of the respiratory tract beyond the nasal cavities would necessarily be immediately subjected to the deleterious influence of this impaired function. And this, I think, is shown by clinical observation, in that, as a direct result of hypertrophic rhinitis, we have the normal function of the pharyngeal tonsil notably interfered with, and, furthermore, its glandular structures subjected to the constant irritation arising thereby. As the result of this the normal secretion of mucus is interfered with, cell desquamation stimulated, and the normal mucus, which, as we have shown, is clear, white and easily fluid, becomes changed into a thick inspissated mucus, largely surcharged with unripe epithelial cells, and, in fact, becomes transformed into a muco-purulent discharge, which, adhering to and clinging upon its surface, hangs down between the palate and pharyngeal wall in thick masses of stringy mucus, which are expelled with great difficulty.

Pathology.—The essential pathological lesion which constitutes a naso-pharyngeal catarrh, whether it is due to a diffuse hyperplasia and cell desquamation involving the whole of the pharyngeal tonsil, or whether it may be due to the adventitious formation of Tornwaldt's bursa, has been the subject of much discussion. The amount of secretion in Tornwaldt's disease is, as a rule, much less than in the diffuse form of the disease, for in Tornwaldt's disease the source of the discharge is from an adventitious cavity, while in the diffuse form the secreting surface involves the whole posterior wall of the naso-pharynx, extending from one Eustachian tube to the other. As the result of the more or less complete closure of the orifice of the bursa, we have, in a certain proportion of cases, the formation of a retention cyst, a condition which Tornwaldt found in forty-five out of two hundred and two cases of bursal disease. Similar cases have been reported by Zahn, Troeltsch, and Czermak.

I have removed, by means of the curette and snare, small masses of the diseased tissue in the diffuse form of the disease in a number of instances. The pathological conditions observed under the microscope were as follows: the hyperplasia was characterized by the bulging of the mucosa, which assumed the form of small raspberry-like projections, which gave the vault of the pharynx a somewhat mammillated contour. This feature was evidenced by the presence of globular protrusions, between which there were furrows of varying depths. The lymph tissue was richly supplied with blood vessels and a rather dense fibrous connective tissue, the latter holding clusters of lymph corpuscles. The lymph follicles were scarce and small. In none of the specimens examined was the presence

of acinous glands demonstrable. In this feature, therefore, the tissue differs essentially from ordinary glandular hyperplasia, in which both the lymph tissue and the acinous glands are augmented in number and size.

We are led to the conclusion, therefore, that the increased secretion in naso-pharyngeal catarrh has its source largely in the furrows or fissures above described, for, as we know, epithelium situated in this manner is transformed into mucus much more readily, and with greater activity, than when it is located upon the surface. Our greatest difficulty in understanding this somewhat curious disease lies in the attempt to harmonize clinical observation with the pathological changes revealed by the microscope, for, while increased secretion is undoubtedly a prominent feature of the disease, the microscope fails to reveal the presence of those conditions usually associated with hypersecretion, namely, an increase or even the presence of acinous glands. We must conclude, therefore, that the increased secretion has its source in the fissures which present anatomical conditions not unlike ordinary mucous glands, and therefore take on a like functional activity. In addition to this we must recognize the fact that this activity is in no small degree stimulated by the presence of the lymphatic follicles.

Symptomatology.—The prominent symptom of the disease consists in the discharge from the vault of the pharynx of a thick, yellow, muco-purulent discharge, which pours from the glands of the vault and makes its way down the pharyngeal wall into the lower pharynx, or, adhering closely to the membrane lining the vault, gives rise to more or less irritation. In many cases, the prominent subjective symptom of which the patients complain is that of a constant "dropping" in the throat. The density of the discharge varies greatly at different times and in different subjects. In some cases, it is almost fluid pus, especially if the source of the discharge is in a bursal cavity. When it comes, however, from the broadly diffused hyperplastic glands of the pharyngeal tonsil, it is a thick, grayish-yellow, tenacious mucus in all cases. The secretion is constant, accumulating of course during the night. This nocturnal accumulation frequently produces nausea and vomiting.

As is usual in all cases of chronic inflammatory process in the upper air passages, its progress is marked more or less by attacks of subacute inflammation, the result of slight exposure to cold, during which the symptoms are markedly aggravated for the time. Moreover, the disease is subject to changes in the weather, the symptoms being worse in the fall and spring months, while the summer months give more or less complete relief.

It is usually stated that the larynx and the air passages beyond are the seat of a mild chronic inflammation; such a condition I believe to be the direct result of a morbid condition of the nasal passages, unless, perhaps, the disease of the naso-pharynx gives rise to so great obstruction to normal nasal respiration as to compel habitual mouth breathing, in which case, sooner or later, laryngeal and bronchial trouble will develop.

Inflammation of the lower pharynx, or of ordinary pharyngitis, is not a concomitant of naso-pharyngeal catarrh, although this is a view usually taken by most observers. I believe a simple pharyngitis to be a somewhat rare affection. It is too much our habit to examine the fauces of a patient, and, observing the tonsil slightly red, congested, relaxed, or flabby perhaps, at once to make a diagnosis of pharyngitis without looking for absolute evidence of inflammatory action there. The lower pharynx belongs essentially to the food tract, and not to the air tract. It is involved sympathetically with gastric catarrh, but not, as a rule, with catarrhal disease of the air passages.

Ten cases are reported by Tornwaldt in which headache was a prominent symptom, and in which relief was obtained by treatment of the naso-pharyngeal trouble. This also we must accept as an interesting contribution to clinical medicine, as confirming the teaching first made prominent by Hack, that in every case of cephalalgia a thorough inspection of the respiratory tract must be made in order to detect any possible source of irritation or diseased action in that region. Whereas the relief of this distressing symptom is one of the most creditable of our successes in throat practice, there is no special symptom, in any given case of headache, which warrants us in the positive assertion that it is dependent on disease of the air passages, and yet this distressing disease is relieved, in a large proportion of cases, by treatment directed to this region.

It is still a very prevalent impression among otologists and others that catarrhal disease of the middle ear is frequently due to a morbid condition involving the naso-pharynx. Tornwaldt indorses this view. Now, while it is an undoubted fact that hypertrophy of the pharyngeal tonsil is the cause of ear troubles in young children, in the very large majority of cases I think this is due mainly to the fact that the pharyngeal space is very largely encroached upon, and its normal functions interfered with, by the mere mechanical pressure of the hypertrophied lymphatic tissue. In adult life, however, whether a naso-pharyngeal catarrh is due to Tornwaldt's bursa, or to a diffuse hypertrophy covering the space, this thickening encroaches so slightly upon the pharyngeal cavity that its normal function is but little in-

terfered with. I do not believe that a middle-ear catarrh is ever dependent on an extension of the catarrhal process from the pharyngeal vault. In other words, I think that if we carefully investigate the clinical history of these cases we shall find that the catarrhal trouble of adult life had its origin in an adenoid during youth, and that this was the original cause of the deafness. Tornwaldt asserts that hyperæmia and hypertrophy of the nasal mucous membrane, and even a persistence of nasal polypi, may be the direct result of a naso-pharyngeal catarrh, a view in which he is sustained, to a certain degree, by Broich and Luc. This assertion I find it exceedingly difficult to harmonize in any way with my own clinical observations. That a nasal hyperæmia or hypertrophy may give rise to a naso-pharyngeal catarrh has already been stated. That the converse is true, as a general rule, I find difficult of rational explanation.

Diagnosis.—The recognition of this disease is based in part on an examination of the pharyngeal vault by means of the rhinoscopic mirror, and in part by the exclusion of disease of the intranasal cavity, though in many instances we shall be compelled to depend largely on the subjective symptoms. I do not think we can decide in any given case that the catarrhal symptoms are directly due to the morbid condition of the vault of the pharynx until the element of intranasal disease has been entirely eliminated. An examination of the pharyngeal vault by means of the rhinoscopic mirror will reveal to us an unbroken continuity of smooth membrane. If, however, instead of the smooth, rounded, dome-like cavity of the naso-pharynx, we find projecting into it from the posterior wall a glandular mass, we have a morbid condition characteristic of this disease. There are two conditions which we recognize in the pharyngeal vault: one, an enlargement of the pharyngeal bursa, and the other, the broad diffuse hypertrophy. The latter has already been described. The bursa is easily recognized as a rounded, almond-shaped projection in the median line, and about midway between the prominence of the atlas and the dome of the pharynx. The noticeable condition that is characteristic of both forms of naso-pharyngeal disease is the large amount of thick inspissated muco-pus which is found in this cavity. The diagnosis of this disease is ordinarily easy, as based on the direct inspection. The symptoms, however, should always aid us, the dropping of mucus from the pharyngeal vault being characteristic of the disease, even when based on subjective symptoms alone. Syphilitic disease, resulting in ulceration and necrosis, may occasionally give rise to a profuse discharge of pus, but in these cases the syphilitic diagnosis is simple and a mistake need seldom be made. Disease of the accessory sinuses gives rise to a purulent dis-

charge from the nose, which frequently makes its way into the pharyngeal vault. This pus discharge is largely voided through the anterior nares into the handkerchief, and, moreover, a discharge from the accessory sinuses is attended by the characteristic fetid-hydrogen odor, which is never present in any form of catarrhal disease of the naso-pharynx.

Prognosis.—This disease involves no dangerous tendencies, and shows no very marked disposition to increase, although it is essentially a chronic affection, and, moreover, shows no tendency whatever to a spontaneous cure. The prognosis as regards cure must be based mainly on our special skill in removing the definite morbid lesion which our examination shows us to be present. In the present state of our knowledge of disease of the upper air passages, I think we are justified in assuring our patients of a complete relief from all the troublesome symptoms. For, in the very large majority of cases, the disease can be cured, provided the patients are willing to submit to the long-continued course of treatment often required.

Treatment.—I am disposed to question the efficacy of internal medication in naso-pharyngeal catarrh as has been suggested by Beverley Robinson, Moure, and others, though if there is a gouty or rheumatic habit, there can be no question that a cure will be facilitated by the administration of gouty and rheumatic remedies; and yet my own clinical experience does not justify the claim that a cure can be accomplished by those measures alone. General hygienic measures are of the utmost importance: the regulation of the clothing, the habits of life, attention to the skin, bathing, etc., such as have already been discussed in the chapter on taking cold. Robinson, in a number of communications on this subject, has advocated, with a considerable degree of enthusiasm, the internal administration of cubebs, as possessing specific properties in the treatment of this disease. As I understand it, he does not positively state that it cures, but rather that it ameliorates the severity of the symptoms. Its action, I take it, is simply as a stimulant, by which a freer and more fluid secretion of mucus is excited from the glanduar structures in the pharyngeal vault. Alcohol and tobacco undoubtedly aggravate an existing naso-pharyngeal catarrh, and should be interdicted. The practice has come into vogue of late years of treating catarrh at our prominent spas, both in this country and abroad, by the internal administration of mineral waters, combined with their local application by means of atomizers and douches. I have never seen any notable good results accomplished by these methods. Robinson and Moure both claim that those mineral waters which contain a large proportion of sulphur are of special advantage in the treatment of

this disease. I see no objection to their use, as most of our patients are benefited by the use of a mild alterative and laxative mineral water. Too great reliance, however, should not be placed on this method of treatment. Climatic influences are very marked, in this as in all forms of catarrhal disease, but the change of residence affords only temporary relief, and the symptoms all return, as soon as the patient is subjected again to the influence of cold and damp atmospheric conditions.

The radical cure of the disease depends, I think, altogether on certain local measures, applied directly to the seat of the disease. Astringent washes and douches, in this form of the disease, not only exert a palliative influence, but also exercise certain curative powers. If the muco-pus be thoroughly removed twice each day, the symptoms are mitigated, and the character of the discharge improved. For this purpose, any lotion which dissolves mucus and controls cell proliferation may be used, as:

℞ Acidi carbolici, ... gr. iij.
Pot. chlorat., ... ʒ i.
Glycerini, ... ʒ i.
Aquæ, ... ad ℥ vi.
M.

℞ Zinci sulpho-carb., ... gr. iij.
Acidi salicylici, ... ʒ i.
Aquæ, ... ℥ vi.
M.

℞ Potass. permanganat., ... ʒ ss.
Aquæ, ... ℥ vi.
M.

The pharyngeal vault cannot be reached through the nasal passages by means of atomizers in such a way as to admit of thoroughly removing the mucus which lodges there. The ordinary nasal douche answers à fairly good purpose, although by far the best device for a thorough cleansing of the pharyngeal vault is the post-nasal syringe shown in Fig. 15.

Radical measures, however, are demanded if the disease is to be really cured. Many patients may object to the cautery, or to surgical interference, and in these cases a certain amount of reliance can be placed on the local application of strong drugs. After thoroughly cleansing the part, the officinal glycerole of tannin, or, better still, the officinal or the compound tincture of iodine may be used, the application being repeated at intervals of from three days to a week, or a solution of nitrate of silver, twenty to thirty grains to the ounce. The acetic-acid preparations seem to possess a special action on this form

of hypertrophy, preference being given to the monochloracetic acid, in its undiluted form. Lactic acid, also, is worthy of trial, and may be used in a solution of from thirty to sixty grains to the ounce.

In making these applications, it is necessary to avoid touching healthy parts; hence the palate should be controlled by means of the palate hook, or, better still, it should be tied back by means of a rubber cord. A very simple procedure by which this measure, which is often unpleasant to the patients, may be avoided, is to make use of a cotton pledget, twisted firmly on the end of a bent probe, the pledget being made sufficiently large to enable the operator to coat its posterior aspect only with the agent to be used. A simple little

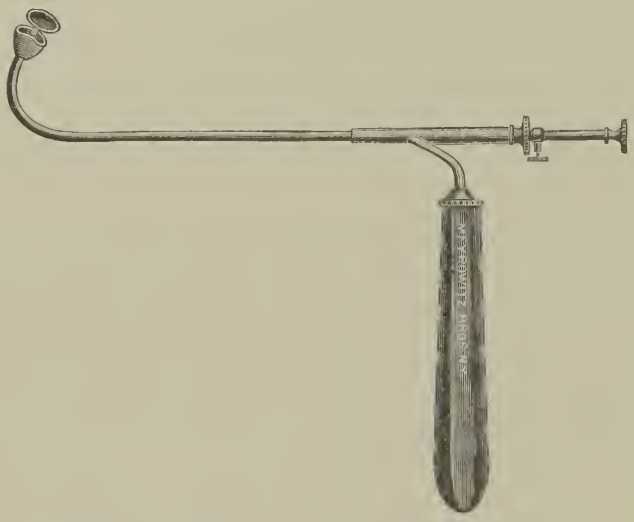

FIG. 52.—Author's Porte-Caustique for Pharyngeal Vault.

instrument for making strong applications is shown in Fig. 52. In the cup may be fused chromic acid preferably, or perhaps nitrate of silver, and this is carried to the vault of the pharynx, when the cup holding the caustic is protruded from the tube by pressing upon a button at the proximal end, and, after sweeping it over the part to be medicated, is withdrawn into the enlarged distal end of the tube, when the instrument is easily removed without injuring healthy parts.

The above simpler measures of local application involve a somewhat prolonged course of treatment, and one in which the ultimate success is not of a most satisfactory character. As before stated, the radical cure of the disease demands the thorough destruction of the offending tissues. Where Tornwaldt's bursa exists, probably the best device for its destruction is in the measure advocated by Torn-

waldt himself, which consists in the use of the galvano-cautery electrode. For this purpose he uses a pointed platinum tip, which is to be inserted directly into the opening of the bursa. Tornwaldt claims, that if thoroughly done one application is usually sufficient, though in most cases repeated applications will be required.

In some cases, Tornwaldt injected the bursa with a ten-per-cent solution of nitrate of silver, making use of a small syringe with a long curved platinum tube, the end of which was inserted directly into the bursal orifice. In other cases, pure nitrate of silver was fused upon the end of a probe, and passed into the bursa, although his results were not so good as with the galvano-cautery electrode. Broich, on the other hand, depended almost exclusively on the injection of nitrate of silver, abandoning the use of the galvano-cautery on account of the intense reaction producing violent occipital and cervical pains which seemed to follow. When the orifice of the bursa cannot be seen, the electrode is simply to be forced directly through the wall, without reference to a normal opening, and the cavity opened up in its long diameter. This closed condition may be the result of morbid action, or there may be a congenital cyst, as in the case reported by Lehmann, in which the cyst was extirpated by means of a pair of curved scissors. In those cases in which the catarrh is dependent upon a broad, flat, diffuse thickening of the glandular structures in the pharyngeal vault, the glandular tissue should be destroyed, and for this purpose we use one of the applications already noticed, by means of the little instrument shown in Fig. 52, giving preference to the chromic acid. If these measures fail, however, we resort to the more powerful action of the galvano-cautery. In this, as in all measures, the part should be thoroughly cleansed first, by the use of the syringe, in order to remove all the adherent muco-pus, after which, the palate being held well under control by means of the retractors or cords, the electrode is passed well up to the upper border of the gland structures, somewhat to one side of the median line, when, the circuit being closed, it is drawn down in a vertical line, to a point perhaps a quarter of an inch above the promontory of the atlas, after which, if the patient tolerates the manipulation, a second and parallel furrow may be made on the other side. The electrode to be used in this manipulation may be the ordinary knife-shaped electrode bent to the proper angle, or, as better protecting the soft parts, there may be used the instrument shown in Fig. 55, in which, as will be seen, the tip is formed by a spiral wire, covered with a hood. Where the manipulation behind the palate is not feasible, the pharynx may be reached directly through the nose by the instrument shown in Fig. 53, in which the transverse wire

across the end of the electrode constitutes the cauterizing part. It can be used on both sides at the same sitting, the cauterization being repeated at the end of a week. After the operation the douche or spray should be again used, in order to cool the part and control any

Fig. 53.—Electrode for the Naso-pharynx, to be manipulated through the Nasal Passages.

tendency to inflammatory reaction. In addition to this, the patient himself should be directed to use the douche twice daily, after the manner already indicated, and report for treatment at the end of a week, when the same procedure may be repeated. As Broich discovered, the galvano-cautery, even in the pharyngeal vault, is often attended with bad effects, inflammatory reaction, neuralgia, etc., and must be used with the greatest possible care. The treatment of these cases of broadly diffused thickening with the cautery is sometimes very unsatisfactory. In such cases the curette shown in Fig. 58 is very useful. The pharyngeal vault is not so easily anæsthetized with cocaine as is the membrane lining the nasal cavity, but no operation should be attempted in this region, without first making a thorough application of a twenty-per-cent solution of this drug, allowing from five to eight minutes to elapse before operative procedure.

CHAPTER XLII.

HYPERTROPHY OF THE PHARYNGEAL TONSIL, OR ADENOID GROWTHS IN THE VAULT OF THE PHARYNX.

This term is used as more accurately describing that condition of glandular hypertrophy in the upper pharynx, which has usually been described under the term adenoid vegetations. It may be defined as a true hypertrophy of the normal lymphoid structures found in the pharyngeal vault, whose existence has been recognized since the days of William Hunter.

Etiology.—The disease is essentially one of child life, developing in infancy, and probably in some cases congenital. Like other glandular hypertrophies, these growths show a tendency to apparently disappear at puberty. The question arises here, how far any general dyscrasia, such as scrofula, syphilis, or tuberculosis, may predispose to this disease.

Löwenberg states that the lymphatic temperament is the "cause of the disease in the very large majority of the cases which he has seen." Löwenberg apparently holds that there is a scrofulous taint in these cases; Meyer and all subsequent writers reject this theory. These growths I think may be considered as the result simply of inflammatory changes in the lining membrane of the upper air passages and their appendages under the stimulus of repeated colds, as formerly stated by myself. It occurs in children more frequently than in adults, for the reason that glandular structures in children are more prone to take on morbid changes. The local inflammatory changes in the region of the fauces which accompany eruptive fevers in children frequently prove a starting-point for changes which result in hypertrophy of the pharyngeal tonsil, or stimulate into a renewed activity an already existing growth in this region.

Heredity has an undoubted influence. We frequently see a number of children in the same family affected. Out of 102 cases reported by Meyer, 52 were males and 50 females, but of those over fifteen years of age, the larger proportion was females. Of my own cases, 49 were females, and 26 males, 21 being under fifteen and 54 above that age.

In a large proportion of cases in which I have seen it, less than half showed any morbid condition in any portion of the nasal passages. It is frequently associated with hypertrophic rhinitis. In ten of my seventy-five cases there was marked enlargement of the faucial tonsils, and in a much larger number moderate enlargement of these glands. In four cases atrophic rhinitis was present, three of these having reached the stage of ozæna.

Pathology.—A microscopical examination of the pharyngeal tonsil shows its construction to be as follows:

First, it is covered by a layer of columnar ciliated epithelium which exhibits the features of stratified columnar epithelium. The single columnar cells vary greatly in height, and exhibit sometimes long, sometimes short, bent ciliæ. Between the elongated feet of the epithelial cells irregular corpuscles of varying shape are visible, such as occur throughout the mucous layer of the aerial passages, the larynx, the trachea, and the bronchi. Only in one specimen was one side of the tumor covered by a narrow layer of stratified epithelium, probably corresponding to the medial aspect of the tumor, without cilia, with a gradual transition into columnar epithelium.

Second, all the tumors exhibit a lobate appearance, the fissure between the lobes being sometimes shallow and at other times very deep, dividing the whole mass into a number of longitudinal ridges. Each ridge may again exhibit a varying number of shallow papillary protrusions. Under the microscope correspondingly we observe large protrusions, which are caused by the follicular formation of the tissue, and small ridges of a papillary aspect caused by narrow protrusions of the subjacent tissue.

Third, the main mass of the tumors is composed of lymph tissue, formerly termed adenoid tissue, from the mistaken idea than this tissue is glandular in nature. No epithelial formations enter, however, the structure of the tumor, save the depressions and furrows between the lobes, sometimes penetrating very deeply into the mass of the tissue, and there producing manifold secondary convolutions. Beneath the epithelial cover there is no fibrous connective tissue around the lobes, while the papillary elevations are produced by a delicate fibrous connective tissue freely supplied with lymph corpuscles.

According to the general structure of lymph follicles and lymph ganglia, we find in the tumors under consideration a varying number of lymph follicles, consisting of an accumulation of lymph corpuscles, and supplied with a comparatively small number of blood-vessels. The follicles are separated from each other and inclosed by what is known as inter-follicular strings. In these both a myxomatous reticulum and the fibrous variety of the connective tissue are more developed

than in the follicles, and the blood-vessels are somewhat more numerous. Only in one of the specimens was there a marked fibrous intrafollicular tissue with comparatively few lymph corpuscles. In all others the fibrous connective tissue was but little developed, which feature would account for the comparative softness of these new formations.

With high power of the microscope, in all specimens the features common to lymph tissue are discernible. There is a myxomatous reticulum ill-defined and crowded with lymph corpuscles, in the meshes within the follicles. There is a more developed myxomatous or fibrous reticulum, with comparatively fewer lymph corpuscles in its meshes within the inter-follicular strings.

The examination proves that the formations under consideration are not tumors, in the proper sense of the word, but a hyperplasia of the lymph tissue which constitutes the so-called pharyngeal tonsil. All writers regard the morbid process which results in this form of growth as one of true hypertrophy, except Woakes.

In connection with the disease in the pharyngeal vault, we often find a chain of enlarged follicles, extending down on either side of the lower pharynx, immediately below the posterior pillars of the fauces, and a large number of scattered follicles over the pharyngeal surface, both in a state of enlargement and constituting a chronic follicular pharyngitis, or what is often called pharyngitis granulosa. Löwenberg regards this as a primary stage of glandular enlargement in the pharynx, which extends to the tissues above, while Roe makes the point that while the disease of the lower pharynx is an hypertrophy of the normal glands, that in the pharyngeal vault is characterized by an involvement of all the normal elements of the mucous membrane. We have already shown that the disease process in the upper pharynx involves mainly the lymphatic structures, the connective-tissue element playing but a very small part in the process. Hence we may safely say that the disease of the two regions is identical. Further, my own observation goes to show that they develop together. Follicular pharyngitis is an exceedingly common affection in childhood, and I think we rarely meet with a case in which the glands of the vault of the pharynx are not notably involved.

Symptomatology.—The prominent and most troublesome symptom to which the presence of these growths gives rise is an excessive discharge of mucus or muco-pus. The source of the discharge is in the diseased glands themselves, their normal secretory function being greatly increased, in the manner already discussed in connection with the pathology of naso-pharyngeal catarrh. In those cases in which the growth has attained a large size, the discharge makes its way

through the nasal cavities proper and is voided through the nostrils. It is a thick, ropy, tenacious mucus, which tends to accumulate in the nares, especially in young children, from which it is expelled with difficulty.

Another symptom which may be traced directly to the existence of these growths is the altered character of the voice. This is changed into what Meyer calls the dead voice. It is the voice of one with a cold in the head; that is, the nasal twang is more or less completely abolished. In this way "m" and "n" become "eb" and "ed."

In Meyer's original paper, prominence was given to the occurrence of ear symptoms in connection with adenoid disease. No symptom of the disease possesses greater importance, or requires more thorough appreciation and study, than that of ear complications, occurring, as they do, early in life, and at a time when only their prompt recognition may save the patient from permanent loss of hearing. The proportion of cases which escape ear-trouble is small. The two aural conditions met with in adenoid disease are chronic catarrhal otitis and chronic purulent otitis. The method of development of these two diseases I believe to be essentially the same. It is usually stated that ear disease from the presence of adenoid growths in the pharyngeal vault is due to pressure on the Eustachian orifice. These growths are of a soft, pulpy consistency, while the eminences which surround the Eustachian orifice are hard and dense; hence, any pressure exerted upon them by an adenoid growth would have but slight if any effect. I think a far more plausible explanation of the symptoms is in the interference with the renewal of air in the middle chamber, caused by their presence in the pharynx. Any cause which interferes with free nasal respiration, if continued sufficiently long, is liable to cause impaired hearing, by its interference with this function. Moreover, the free action of the levator palati muscles is interfered with by the presence of these growths, and this movement is of the utmost importance in accomplishing this mechanism of air renewal. In studying these parts by the rhinoscope, the impression is gained that the tendency of muscular movement here is to force air into the middle ear.

As a result, then, of this interference with the normal respiration, rarefaction of air gives rise to a condition of hyperæmia of the mucous membrane extending through the Eustachian tube and middle ear. Now, this hyperæmia does not constitute inflammation. Inflammation, as I take it, is attended with hypersecretion. Hypersecretion is not always a feature of chronic catarrhal otitis media, so-called. The Eustachian orifice is closed, the air in the middle chamber rarefied, the drumhead retracted, and further changes in

connection with the more intricate apparatus of the ear result in impairment of function. In a very large number of cases this process continues, leading to ankylosis of the ossicles and atrophy of the tympanic membrane. In the smaller proportion of cases, arising in the same manner from nasal stenosis and rarefaction of air in the middle chamber, we have set up a true catarrhal inflammation with hypersecretion. Now, as an invariable law, when we have catarrhal inflammation setting up in a closed cavity, this process is converted into one of suppuration. As the result we have a chronic suppurative otitis media. Why this occurs in one case and not in the other I do not know.

That the ear symptoms are due to an extension of catarrhal inflammation to the Eustachian tube I think is very questionable. Certainly it is very rare to find the lining membrane of the Eustachian orifice in a condition showing any evidence of catarrhal inflammation by rhinoscopic examination. Mechanical obstruction is an active, although not the most prominent, agent in the development of these symptoms.

Nasal stenosis is quite a prominent symptom of the affection, and is present even in cases in which the growth has not attained an unusual size.

It is a very noticeable fact that these growths vary in size at different times, under the influence of damp weather or other causes. This occurrence, especially in children, is attended with an increase of secretion, with obstruction to nasal breathing; in fact, the child has apparently an ordinary cold in the head. We must bear in mind that acute rhinitis is comparatively rarely met with in a child, and that in such cases it is really suffering from a subacute inflammation of the pharyngeal tonsil. In other words, the clinical history of chronic inflammation or hypertrophy of the pharyngeal tonsil is marked, like inflammatory processes in other portions of the upper air tract, by a liability to repeated attacks of acute inflammation.

Cough is present in certain cases, caused by the secretion, or by the habitual mouth breathing.

Headache is an occasional symptom, not perhaps occurring with the same frequency as in hypertrophic rhinitis. It probably arises in much the same manner as do those cases which depend on disease of the nasal chambers.

Asthma, also, may be dependent on the existence of adenoid growths, as noted by Fränkel and Chatellier. One such case has come under my own observation, in which complete cure was obtained by the removal of the growth.

Chatellier mentions nightmare as a symptom of the disease.

This symptom is rather an accompaniment of enlarged tonsils, a disease in which it occurs quite frequently. I should be disposed to attribute it to the enlargement of the faucial tonsils, which so frequently accompanies the affection under discussion. Snoring, on the other hand, is almost always present in disease of the pharyngeal vault, due probably to a certain amount of relaxation or weakness of the palatal supports, which accompanies the disease. In very young children, the inability to nurse, the result of nasal stenosis from this or any other cause, is well known. Spasm of the glottis, also, in children of neurotic habit, may be a very troublesome symptom of the disease.

Both Hooper and Chatellier mention night sweats as one of the symptoms of the disease. This symptom is present in a certain proportion of cases, but probably only in those whose general health is poor.

Fig. 54.—The Face of a Girl Illustrating the Peculiar Facial Expression which is Characteristic of the Existence of an Hypertrophied Pharyngeal Tonsil. (Hooper.)

Probably no symptom of adenoid disease is more striking than the peculiar facial appearance which these patients present. This appearance, is, however, most noticeable in children under the age of fifteen or sixteen years, but it is so marked in these young people that in the majority of cases a glance at the patient is sufficient for a correct diagnosis. This peculiar facial expression consists essentially in a broadening and flattening of the bridge and root of the nose. Now, add to this the open mouth, usually rendered necessary by the nasal stenosis, and you will give to the child a curiously vacant, semi-idiotic look, which is very striking (see Fig. 54).

I think that ordinarily the essential feature of the facial expression lies at the root of the nose, in its broadened and flattened contour, by which there is apparently a widening of the distance between the two eyes. The idiotic expression is perhaps fanciful, for the mere opening of the mouth and depression of the jaw gives that, although the dull expression is undoubtedly enhanced by the impairment of hearing, which so frequently exists in these cases. In my own experience, I have never been able to discover that these patients were not the possessors of the ordinary brightness and alertness of

intellect of children in ordinary health. That there is any morbid development of the facial bones, as suggested by David, becomes questionable, when we remember how rapidly all these conditions disappear after the removal of the growths, as do also the other symptoms alluded to, such as mental apathy, inattention, etc. When the growths are large and nasal stenosis is marked, the sense of smell is necessarily impaired, from the imperfect manner in which odorous particles reach the terminal filaments of the olfactory nerve. The sense of taste also is impaired, as is usually the case when the sense of smell is defective.

Diagnosis.—The prominent symptoms of facial expression, dead voice, nasal stenosis, and catarrhal discharge will ordinarily prove sufficient for a correct diagnosis. Examination, however, by the rhinoscopic mirror gives always the additional information of the size of the growth. By anterior examination nothing will be learned ordinarily, other than the absence of a diseased condition of the nasal cavity, to account for the trouble. By posterior rhinoscopy, instead of the rounded dome-like cavity of the pharynx, there will be presented a rounded mass of a reddish-gray tinge, with a mammillated surface, hanging down, as it were, and obstructing the view into the nasal cavities. I think the best test for the existence of an adenoid growth is to trace the continuity of the pharyngeal wall, by inclining the mirror slowly forward, in such a way as to bring progressively into the field of vision the posterior wall of the pharynx, gradually passing over to the broad expanded upper portion of the nasal septum, and tracing its converging lines until it reaches the palate. If in this inspection we find the view of the upper portion of the nasal septum obstructed in a greater or less degree, we recognize the presence of a growth whose uniform contour and symmetrical appearance will indicate hypertrophy of the normal tissues or an adenoid growth. In tracing the continuity of smooth surface from the pharynx to the septum, we will find that even a comparatively small growth will interrupt the view and shadow the broad upper portion of the nasal septum. The size of the growth will be estimated by the extent to which the nasal septum is veiled on inspection by the pendent growth.

In adult life the growth presents a smoother contour, the fissures having to an extent disappeared. The location of the growth does not, I think, vary greatly in different cases. It constitutes, in mild cases, a broad ridge extending across from one Eustachian tube to the other. If the tumor is of larger size, the centre of this ridge becomes enlarged and rounded, and projects farther downward and forward toward the soft palate. Meyer describes these growths as being

found both in the fornix, or upper portion of the pharynx, and on the posterior or lateral walls of the upper pharynx, and very rarely on the floor of the nares, where they form, as it were, a duplicature of the soft palate. He also describes hard round spots on the velum which he considers of an identical nature.

The lower pharynx presents no distinctive appearances in these cases, although it is an almost invariable rule that there is chronic follicular pharyngitis with more or less purulent secretion, whose source is in the diseased condition of the pharyngeal vault.

All observers recommend a digital exploration of the pharyngeal vault as an additional aid to diagnosis. This is not a difficult manipulation, and is generally fairly well tolerated by children, and yet I think is rarely necessary. Very little information is gained thereby which is not already obtained by the subjective symptoms and rhinoscopic examination; although, when rhinoscopy is impracticable this should be always resorted to, as giving us information not only of the presence of the growth, but also of its size and character. Lennox Browne makes an excellent suggestion on the carrying out of this manipulation, which is that when the finger has reached the pharnyx, the lower portion of the septum should be first sought, and this traced up with the tip of the forefinger, until the growth is impinged upon, when the exploration of the right and left walls may be completed.

Schech, quoting Semon, advocates as an equivalent for digital examination of children, which is occasionally difficult and even painful, that the permeability of the naso-pharynx be tested by injecting a small quantity of warm water by means of a ball syringe. If the water does not at once flow in a stream from the other nostril, but, on the contrary, escapes through the mouth, then it is certain that there is an obstruction in the naso-pharynx. This method is also recommended, to prove whether or not an operation has restored the passage. This expedient is a most excellent one, and may well be resorted to before digital exploration is practised. A much better method, however, is in the use of fluid cosmolin or sweet oil, atomized by the instrument shown in Fig. 18. As we know, when this is atomized it forms a cloud, as it were, of the density of smoke. If this is sprayed into one nostril, where the nasal passages and naso-pharynx are clear, it will emerge from the opposite side in a stream whose force and direction are almost equal to that with which it escapes from the tip of the atomizer. If, on the other hand, the naso-pharynx is obstructed, the spray emerges from the opposite side in a very feeble stream, or even fails to emerge entirely. This is, I think, without doubt our best and certainly our easiest test for the existence

of an adenoid growth in the naso-pharynx, and one which I regard as almost absolutely diagnostic.

Prognosis.—The prognosis in these cases is always favorable, as regards the entire disappearance of symptoms as the result of treatment. It has already been stated that there is a tendency at puberty for these growths to atrophy to a certain extent. The question arises, then, how far we may be justified in leaving mild cases to the natural course, when the development attending upon puberty may be expected in the near future. There is undoubtedly an atrophic process which sets in at puberty, but this does not always cause an entire disappearance of the tumor. The fact that its symptoms are markedly ameliorated is probably due in part to the great development which takes place at that age, causing the glandular mass to occupy a relatively smaller space in the breathing passages. I think, when we consider that the treatment involves no possible risk to the patient, and also that the growth is subject to attacks of acute inflammation, by which danger, oftentimes of a serious character, is threatened to neighboring organs, that we are rarely justified in adopting the expectant course. It should be stated, furthermore, that these tumors do not, as a rule, entirely disappear at puberty, but in many cases remain as a permanent source of a chronic naso-pharyngeal catarrh.

If serious ear complications have already set in before a case is subjected to treatment, I think we may lay it down as a rule, that in children a favorable prognosis may be given, not always perhaps as to the ultimate restoration of hearing, but certainly to very great improvement. This statement can be safely made with regard to chronic catarrhal otitis media. It is also true in suppurative disease, I think, with few exceptions. In those cases which have gone on to necrosis we all recognize the peculiar obstinacy of the affection with which we have to deal, and yet my own experience teaches me that we are often warranted in giving a favorable prognosis as regards improvement, even here.

Treatment.—The simpler methods of general medication are probably indicated in many of these cases, on account of the impairment of the general health which is often present. These measures embrace simply the administration of cod-liver oil, with general tonics. My own preference is decidedly in favor of cod-liver oil, when tolerated. In the majority of cases, however, no internal medication is indicated.

The question as to the value of local treatment by means of douches and sprays is rather an interesting one. In the majority of ordinary catarrhal affections of the upper air passages, the use of

astringent sprays is attended with very little, if any, permanent benefit. In glandular enlargements, however, of the kind under discussion, especially when we consider their very soft consistency and low grade of organization, the use of astringents is attended, oftentimes, with the best of results, both in limiting the amount of secretion and in securing an absolute reduction in the size of the growth. This, however, is all that is accomplished. A cure cannot be looked for unless in the very early stages of the disease, when the growth has attained but a limited size. Furthermore, I think much can be accomplished by the use of astringents in preventing the frequent recurrence of attacks of acute inflammation, to which those suffering from the disease are so liable. The only form of medication, probably, adapted to the disease is that of a watery solution. A well-grounded prejudice exists against the use of the Thudicum nasal douche in adenoid disease. There is no doubt that mischief may be done by the use of this device, and now that the ingenuity of our instrument makers has placed in our hands so many and such efficient hand-ball atomizers at a moderate price, preference should always be given to the spray, as a means of local application, over every other device. We give preference then to the instrument shown in Fig. 18. Probably no better astringent can be used in these cases than tannin. My own custom is to prescribe this in the following combination:

℞ Acidi carbolici,	gr. i.
Acidi tannici,	gr. xl.
Sodii biborat.,	gr. xx.
Glycerini,	ʒ ss.
Aquæ,	ad ʒ iv.

This is to be applied twice daily at home. One of the most troublesome features of the disease is the large accumulation of mucus in the nasal cavities and the difficulty the child experiences in expelling it. The above lotion is cleansing, disinfectant, and astringent, and, being thoroughly applied at the hands of the mother or attendant, fulfils well these three indications.

As before stated, all that can be expected by local medication is a modification of the symptoms. A radical cure is dependent upon a thorough extirpation of the offending glands. This must be accomplished either by destructive agents, such as the chemical or potential cautery, or by the snare or cutting instruments. Owing to the prejudice against surgical operations in the minds of many people, we will occasionally be compelled to resort to destructive agents for the removal of these growths, although in all cases, I may state here, the

complete extirpation by an operation is the preferable mode of procedure. The use of caustics is attended undoubtedly with successful results, although it involves a long course of treatment. Here I think the galvano-cautery possesses a destructive power which is far more active than are chemical agents, and is always to be preferred.

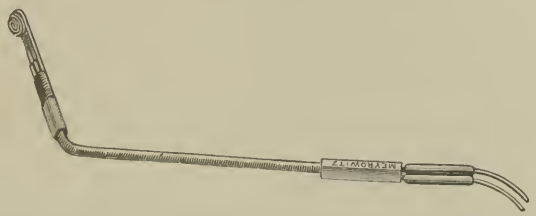

Fig. 55.—Author's Electrode Fitted with a Shield for use in the Pharyngeal Vault.

The manipulation by which this is accomplished is quite simple. The only risk to be avoided is of burning the soft parts. The electrode shown in Fig. 55, it will be noticed, is fitted with a hood in such a manner as to thoroughly protect the palate from injury in withdrawing the instrument. In small children it is not always feasible to introduce the curved electrode behind the palate, hence we are compelled to introduce the instrument through the nasal passages. If introduced in this manner, the platinum tip will usually strike the central portion of the mass, and a considerable destruction of tissue may thus be accomplished. Moreover, there is abundant room for a vertical movement to be permitted in this manipulation, by which successive portions of the growth may be subjected to cauterization. The electrodes by which this is accomplished are shown in Fig. 56. In the absence of the cautery battery, chemical agents must be used. Of these, I should give preference to chromic acid fused on the end of a properly shaped applicator, which may be

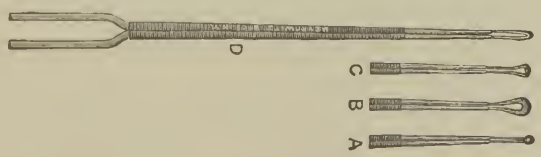

Fig. 56.—Straight Electrodes for the Application of the Galvano-cautery to the Pharyngeal Tonsil, through the Nasal Cavity.

arranged in the same manner, with a protecting hood, as the electrode already mentioned, or the applicator may be concealed in a tube, as shown in Fig. 52, and protruded after the instrument has been passed into the pharyngeal vault. Manipulation through the lower pharynx is not always tolerated by young children, and in a number

of cases in which the nasal passages have admitted of it I have made the application directly through the nares, the applicator being protected by a small slender tube and protruded after this has been passed through the nasal cavities. Löwenberg prefers nitrate of silver.

As already stated, the complete extirpation of these growths by a surgical operation should always be resorted to, in preference to any other measures. Most observers who have written on the subject of adenoid growths have presented instruments and methods of their own devising for the accomplishing of this end. Meyer uses a ring-knife, consisting of a small transverse oval ring with one sharp though not absolutely cutting edge. The patient being seated with the mouth gag firmly fixed in position, the ring knife is passed through the nose and, its manipulation directed by the left forefinger, passed into the vault of the pharynx. In this manner the growths are removed as far as possible on that side, when, if necessary, the

Fig. 57.—Löwenberg's Forceps.

knife is transferred to the other nostril and the remainder of the tumor extirpated. Where there are portions left on the lateral walls of the upper pharynx, he completes the operation by means of an instrument not unlike a lithotrite. To prevent recurrence, he advises a weekly application of the mitigated stick of nitrate of silver.

The use of forceps for the removal of these growths was probably first suggested by Löwenberg, whose instrument is shown in Fig. 57. It has a cutting edge on the distal extremity of the blades. Its movements are guided by the left forefinger in the pharynx or by the rhinoscopic mirror. Cohen recommends the evulsion of the growths by a gouge-cutting forceps, modelled after Mackenzie's laryngeal forceps. Woakes modifies Löwenberg's forceps by prolonging the cutting edge down on the posterior aspect of the blade, thus adapting the instrument to cutting on the posterior wall of the pharynx; while Schech still further modifies Löwenberg's instrument by prolonging the cutting edge completely around the three aspects of the distal extremity of the blades. In the above instruments the blades all operate transversely in the pharynx. Schutz, however, recommends the

use of a forceps with a fenestrated blade operating antero-posteriorly, the only advantage of which lies in the fact that in this manner, perhaps, the pendulous masses which are occasionally found in the upper portion of the vault are more easily seized, while those portions of the growth which lie more on the posterior wall would scarcely be grasped. Major's adenotome is also constructed on this principle. The use of a curette naturally suggests itself for the extirpation of these growths, as first mentioned, I think, by Löwenberg. His instrument has a sharp cutting edge, and is attached to its handle by an S-shaped stem. Victor Lange indorses this method of operation, while Chatellier considers it a rather dangerous operation. Fränkel advises it only in cases in which the growths are not to be reached with the forceps. This instrument is undoubtedly available for use when the growth is small, but is not to be recommended in the case of a large growth. It is also useful for the removal of the remaining fragments if the main mass has been removed by one of the other methods. A form of curette which I make frequent use of in this manner is shown in Fig. 58. It consists of an ordinary Sims' uterine curette, with the shank bent to the proper angle for introduction to the pharyngeal vault. Trautmann advises the use of a sharp spoon, which is virtually the same device as the curette. Guye, of Amsterdam, dispensing with all instrumental aid, states that the growths can be entirely extirpated by the index finger inserted behind the palate, the process being accomplished partly by crushing and partly by scraping with the finger nail. Creswell Baber indorses this method, but is entirely correct, I think, in the assertion that their complete removal cannot be accomplished in one sitting, stating that it should be repeated at intervals of one week,

Fig. 58.—The Author's Sharp Cutting Curette for the Pharyngeal Vault.

till the cure is completed, which, as a rule, requires four or five sittings. In the same category are the methods employed by Dalby and Lennox Browne, who make use of a curette, or spoon, attached to a thimble, which is fixed upon the end of the forefinger. In this manipulation, the tip of the finger is left free for exploratory purposes, the shaft of the curette being attached to the posterior face of the open thimble. Michael, of Hamburg, has devised a rather ingenious instrument, which somewhat resembles Woakes' forceps, excepting that the blade of the instrument shows a more extended curve, while

the hollow of the instrument extends the whole length of the curved portion of the blade, which is of uniform breadth and presents a sharp cutting edge. In addition to this, the shafts of the instrument curve outward, in such a manner as to allow the uvula to drop between them. With various writers advocating different methods for extirpating these growths, the question arises, which is the most simple and efficient instrument for this purpose? Personally, I have always entertained a prejudice against forceps, and most of the writers

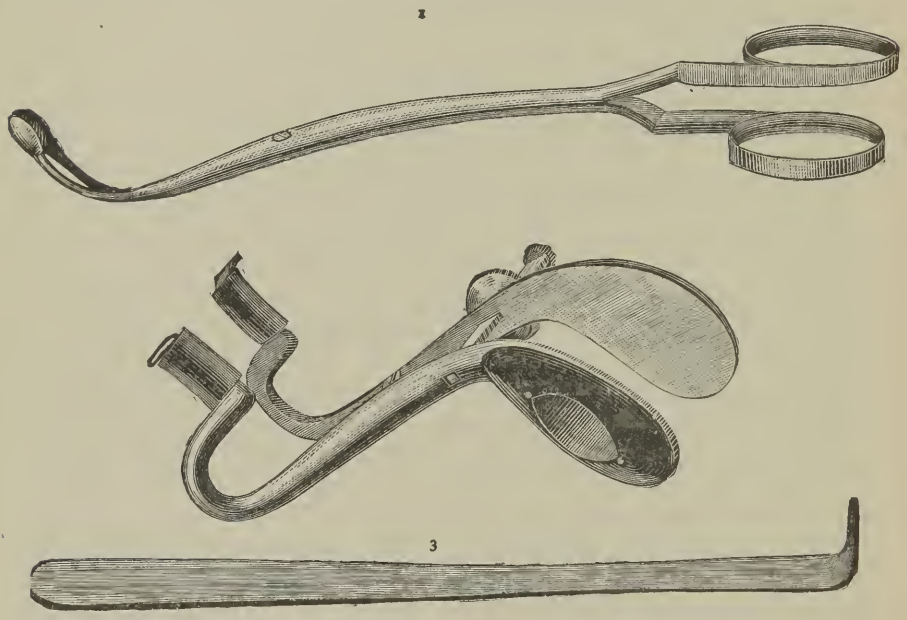

FIG. 59.—Hooper's Instruments for the removal of Hypertrophied Pharyngeal Tonsils. 1, Forceps; 2, mouth gag; 3, palate retractor.

who recommend them acknowledge that the operation cannot be completed at one sitting; although Hooper states that the complete extirpation of the growth may be done at one sitting by the forceps operation, if the patient is put under the influence of an anæsthetic, the palate thoroughly retracted, and a mouth gag used. Hemorrhage is often produced in forceps operation, and, as Hooper suggests, a sufficient time should be permitted to lapse after each introduction of the forceps to allow the hemorrhage to cease. In spite of this, many cases will be attended with hemorrhage sufficient to interfere with this method of operating. Hooper operated with the forceps (shown in Fig. 59, 1), the mouth being held open by a gag, and the palate elevated by a Voltolini hook (Fig. 59, 3). As regards Meyer's method of operating, we can only say, in view of the excel-

lence of his results, that no better method of procedure can be suggested, provided one possess the necessary manipulative skill. It should be said, however, that it seems somewhat complicated, and at the best not an easy operation to perform with very young children, especially when we consider that one operates without an anæsthetic, the patient being fastened to a chair. For a number of years I removed these growths by the use of a long Jarvis snare. The distal extremity was bent to the quadrant of a small circle, and the instrument mounted with the No. 5 piano wire. The growth having been observed and its size carefully estimated, a loop was formed of sufficient size to embrace it and then bent forward over the end of the instrument, thus forming a sharp kink. The wire was now played out of the snare an eighth of an inch, when the whole loop was thrown sharply back toward the handle of the snare, thus giving it another bend. As will be seen, the loop was now in a position for easy introduction behind the palate without touching the parts, and was passed immediately to the base of the growth. When in position the reflex movements of the fauces in no way interfered with the subsequent manipulation, which consisted in simply turning the screw of the snare, the loop of which, being forced against the posterior wall of the pharynx by the kinks in the wire, rapidly constricted the growth and severed it at its base. An advantage of this procedure was in the comparatively trifling hemorrhage which ensued.

In many cases small lateral masses of adenoid tissue remained, which were subsequently removed by means of the author's polypus snare, manipulated through the nose. These operations were usually done without a general anæsthetic, except in the case of quite young children, who as a rule of course are not tractable.

Since the introduction of Gottstein's curette, shown in Fig. 60, the removal of these growths has been so greatly simplified by its use that few of us nowadays resort to any other method. The device and its manipulation are easily understood by a reference to the illustration. Like all new instruments, its introduction was followed by a large number of modifications of various kinds, but in my own experience the original instrument, in which the cutting blade stands at a right angle with the handle, is by far the most efficient, as I have not observed the varying location of this diseased tissue described by so many writers, but find it occupying much the same place in all cases, viz., the posterior wall and roof of the upper pharynx, the line of its base constituting a shortened quadrant. The instrument is passed behind the palate, which is to be securely engaged and drawn as far forward as possible, and then the cutting blade is carried firmly and forcibly upward between the growth and the posterior border of the

septum. When the roof of the upper pharynx arrests the further elevation of the cutting blade, the instrument is swept backward and downward by a quick movement, and its distal extremity comes into view from behind the palate, accompanied by the severed mass. The hemorrhage of course is quite profuse, and this renders it better in operating with the curette that the child should be held in the lap of an attendant, in preference to being placed supine upon an operating table, since, as soon as the operation is completed, the child can be more quickly thrown over on its stomach across the knees of the attendant, and its head placed over a receptacle until the bleeding ceases, which occurs in about a minute.

If the growth does not emerge with the instrument, it is easily displaced by gently blowing into the nostril with the Politzer bag. If the hemorrhage seems to persist, I have usually controlled it by

FIG. 60.—Gottstein's Curette for the Removal of Hypertrophied Pharyngeal Tonsils.

first clearing the passages by blowing the child's nose in the manner just mentioned, viz., by the Politzer bag, and then insufflating europhen by the ordinary powder blower.

The application of the europhen serves not only to control hemorrhage, but also to disinfect the cut surface, a very important consideration in these operations in the upper air tract, since in a too large proportion of our cases infection follows, as shown by the fibrinous exudate which forms on the cut surface, and the patient suffers for several days from practically an attack of acute follicular tonsillitis, with its high fever and marked systemic disturbance. Hence the ordinary antiseptic surgical procedures should be as rigidly followed as possible in sterilizing instruments and applying disinfectants to the wound. In my experience europhen is quite as serviceable as iodoform, and is free from its intolerable odor.

The question of the administration of an anæsthetic is one which every operator will decide for himself in individual cases. In adults and older children it will rarely be necessary. In young children, however, whatever the operation, it will be found necessary to administer chloroform or ether. If the operation is prolonged, complete anæsthesia will be necessary, and therefore ether is to be preferred. In the shorter operations, by means of a cutting instrument, or my own operation by the snare, complete anæsthesia is not necessary. I have always found that a few whiffs of chloroform answer every purpose. The child will become completely relaxed, and will remain so

until the operation is completed. In this manner, I think, we incur none of the dangers attendant upon the use of chloroform, and, furthermore, none of the disagreeable features of etherization are encountered.

My plan is to sprinkle perhaps half a drachm of chloroform on a handkerchief, and, seizing the child, surreptitiously as a rule, to hold the handkerchief firmly over the mouth and nose, while at the same time, the child is drawn down on the lap and held firmly. Primary anæsthesia is thus secured, and the operation completed before he is aware that anything has been done. In all cases, probably, whether a general anæsthetic is used or not, it is wise to apply a ten or twenty per cent solution of cocaine, to secure such local anæsthesia as it may afford, together with the vascular depletion which attends its use. Of course, this will always be used when operating without general anæsthesia, and yet it should be stated that its action upon the glandular hypertrophies of the pharyngeal vault is very unsatisfactory. It modifies possibly the pain of an operation, but does not absolutely control it.

The question of recurrence has been discussed by most writers, and all concur in the statement that complete extirpation is never followed by a return of the growth.

SEQUELÆ.—Hemorrhage very rarely occurs in a degree sufficient to demand interference. If such an accident should occur, a tampon inserted into the pharyngeal vault is usually sufficient to control it. Acute otitis media has been mentioned by Meyer, Fränkel, and others, as occurring after an operation upon these growths. Fränkel states that it is more liable to occur after a secondary operation, and especially when this is done too soon after the previous sittings. It is probably more liable to occur as the result of the use of the curette or forceps, on account of injury done to healthy tissues. Another accident which attends the operation in a certain proportion of cases is the occurrence of a fibrinous exudation on the cut surface, giving rise to an ordinary attack of acute follicular disease of the vault of the pharynx, extending in many cases to the follicles of the lower pharynx. This is accompanied with a rapid pulse, general febrile motion, muscularpains, sore throat, painful deglutition, and, indeed, all the local and general symptoms of an attack of that disease, and is to be treated in much the same manner as the idiopathic affection. This does not ordinarily seriously complicate the operation, or interfere with its success, although in a few instances I have thought that it semed to stimulate the tissues to a renewed activity, under which a partial recurrence of the growths supervened. I know of no way to prevent this complication.

CHAPTER XLIII.

FIBROMA OF THE NASO-PHARYNX.

This term is used to designate a form of neoplasm of the naso-pharynx which is composed almost purely of fibrous tissue. Springing from the basilar process of the occipital bone, and increasing by a somewhat slow process of growth, it gradually invades neighboring cavities, sending prolongations into the nasal passages and into the pharynx below, while at the same time it pursues the same relentless course as fibroma in the nasal cavity, crowding all the tissues before it and resulting in absorption of both the soft tissues and bony structures which intrude themselves upon its path.

The tumor is a sessile growth from its onset, and, although occasionally reported as a naso-pharyngeal polypus, it never assumes the gross characteristics of the latter.

Etiology.—It is difficult to assign any active cause for the development of these growths, in that they arise from tissues showing no evidence of morbid activity and in individuals apparently in the enjoyment of perfect health.

In the majority of instances they occur in males, and usually at about the age of puberty. In general, these growths occur from the ages of fifteen to twenty-five years, while in females the average age is slightly greater.

Symptomatology.—These growths usually manifest themselves very early, one of the first symptoms, perhaps, being the occurrence of repeated and sometimes profuse attacks of epistaxis. The source of this bleeding, in the majority of instances, arises from the blood vessels coursing on the surface of the growth itself, the tumor usually being exceedingly vascular. Hemorrhage may occur without warning. In two instances which came under my own observation, there seemed to be a disposition to the occurrence of the epistaxis during sleeping hours, the patients being awakened by the choking sensation produced by the flow of blood into the air passages. The presence of the growth is indicated by a sense of fulness in the naso-pharyngeal region, with a very early impairment of the voice, which assumes the characteristics of the "dead voice" observed in connection with

adenoid disease of this region. As the growth increases there is usually bilateral stenosis.

With the occurrence of stenosis, the peculiar facial expression always met with in naso-pharyngeal tumors shows itself. As the tumor grows, a genuine facial deformity results; prolongations of the tumor may extend into the nasal cavity, and make their appearance externally; or they may make their way into the accessory sinuses and cause additional facial deformity. Exophthalmos may be a later symptom, this occurring either as the result of a direct invasion of the orbit, or in consequence of the lifting of the orbital plates by the pressure of the growth from behind. The occurrence of exophthalmos indicates in the majority of instances the invasion of the antrum, although it may be due to an invasion of the ethmoidal cells.

A certain amount of secretion of a thick, tenacious mucus or mucopus is always present. The normal movements of the fauces are notably hindered and the secretion tends to become inspissated, and thus accumulates in and about the growth and is voided with considerable difficulty. As the growth extends into the lower pharynx, it impinges upon the soft palate, crowding it forward into the mouth, not only interfering with the act of deglutition but preventing the closure of the palato-pharyngeal space, as a consequence of which fluids are liable to be forced into the nasal cavity during the act of deglutition. Dyspnœa may occur later in the disease, owing to the extension of the growth downward and the mechanical interference with the entrance of air into the lungs.

Pathology.—These tumors are composed almost entirely of dense, white fibrous tissue, containing very few if any elastic fibres; their minute pathology has been sufficiently described elsewhere.

The growth is regularly rounded in outline at its onset, while subsequently its shape is modified by the bony walls of the cavity which it invades. The origin of these tumors is probably in all cases from the periosteum of the basilar process of the occipital bone, although it may in part arise from the body of the sphenoid adjoining. They probably spring from a comparatively small area, but as they develop their point of attachment increases. The primary origin of the tumor is somewhat important, and has been the subject of special investigation by Beuf, Brevet, and D'Ornellas, who agree essentially with Nélaton that these tumors invariably spring from the base of the cranium, and that, where there is an apparent origin from the bodies of the vertebræ, the wings of the sphenoid, or from the parts lower down, it is due either to the burrowing, as it were, or to spreading of the original attachment. As the tumor extends to neighboring parts and cavities, adventitious attachments are formed.

Diagnosis.—A fibroma can be recognized, even at its onset, by an inspection of the vault of the pharynx, by means of a rhinoscopic mirror, when it will be seen as a small, irregularly rounded growth, of a light pinkish color, springing from the upper portion of the cavity, the gross appearances of the tumor giving the impression of a whitish mass seen through a pinkish veil, and on its surface larger blood-vessels may be seen. If the vault of the pharynx is explored by the index finger, the tumor will be found hard, dense, resisting, and to a certain extent immovable. This manipulation, however, should be resorted to with considerable care, in that troublesome hemorrhage can easily be excited.

A fibroid tumor in the upper air passages presents gross appearances unlike any other form of neoplasm met with in these regions. An osteoma can always be recognized as such, by means of the probe or the needle. Chondroma is exceedingly rare in the naso-pharynx, and presents a decidedly warmer and deeper red color with a yellowish tinge, is absolutely immovable, manifests no tendency to hemorrhage, and can be subjected to palpation with impunity, and, finally, its dense cartilaginous consistency can be determined by means of the needle. Malignant growths present no gross appearances which in any way need lead to confusion. The only diagnostic point really of importance in this connection is as to the origin of the tumor from the nasal cavity proper or from the naso-pharynx, its fibroid character having been recognized. This question is not always easy of determination when the growth has obtained such proportions as to have invaded one or the other of the nasal passages. I am disposed to say in this connection that a fibroid tumor which in its incipiency produces bilateral stenosis can in the majority of the instances be regarded as of basilar origin, while a tumor which produces unilateral stenosis early in its development springs from the nasal cavity proper.

Prognosis.—Naso-pharyngeal fibroma in itself is not necessarily a fatal disease, and yet, when we consider the fact that there is no limit to its growth, that its progress is oftentimes marked by the occurrence of grave complications, that it may very early in its history encroach upon vital parts, and, finally, the very serious character of the operations which heretofore have been so frequently resorted to for its removal, it becomes an excedingly grave affection. The principal complication during the development of the tumor consists of the repeated attacks of hemorrhage, which may serve to markedly impair the general health, or may even result in a fatal termination.

Invasion of the cranium, as the result of erosion of the basilar process, probably never occurs, but the growth may send a prolonga-

tion through the foramen lacerum medius. These growths rarely, if ever, develop after puberty, but during earlier years their growth is somewhat rapid. With the attainment of puberty a notable arrest of development is very frequently observed, which may in rare instances go still further and result in a retrogressive movement, under which a tumor may completely disappear. These growths sometimes, but rarely, disappear by sloughing. With the improved methods of our own day, by means of which all affections of the upper air passages are brought so completely within reach for operative procedure, we may undoubtedly look for better results of treatment than used to be expected, especially if the somewhat grave operation of resecting the superior maxilla is avoided, and it is fairly safe to give a favorable opinion in a fairly large proportion of cases. This view is certainly justified by the admirable report made by Lincoln, who, in a collation of fifty-eight cases, in which seventy-four operations were done, has shown us that of these, thirty-eight operations involved opening the face by the resection of the superior maxilla.

Of the thirty-eight severe operations done, but ten cases were cured, while with reference to the milder operations the statistics are much more favorable. The simpler operations were not done on selected cases, and even when the tumor has attained large proportions and given rise to serious complications, Lincoln's figures show that we are warranted in giving a far more favorable prognosis, if a milder operation is to be resorted to, than when the patient is to be subjected to the additional risk of opening the face.

Treatment.—The surgeons of ancient times recognized tumors of the naso-pharyngeal cavity, and attacked them apparently by much the same methods as are often used at present.

Undoubtedly many cases occur in which, on account of the size of the tumor, removal of the superior maxilla will be demanded, yet the nicer manipulations which characterize the surgery of the present day will enable us successfully to extirpate the neoplasm in a far larger proportion of cases than hitherto, with the result of a very marked improvement in the percentage of cures. There are a number of devices which may be resorted to for the destruction or extirpation of these growths, by which the patient is saved from the danger of the radical operation. Barthelemy reports the case of a fibroma, completely filling the naso-pharynx and projecting into the mouth, which had recurred after a previous operation by incision of the soft palate, which was eradicated by injections of a saturated solution of chloride of zinc; while in another and very similar case, having failed to extirpate the growth by means of the écraseur, forceps, and other methods, he incised the palate, and made injec-

tions of the same preparation of zinc into the body of the tumor. The growth was destroyed by nine injections. Upson also reports having successfully treated three cases of naso-pharyngeal growth by injections of acetic acid. These results are important as illustrating treatment which is exceedingly simple and requires no special manipulative dexterity. The only objection against it is the length of time required, during which the patient is subjected to the presence of sloughing tissue, with its resultant fetid discharge and disagreeable odor.

Evulsion is available in cases in which the growth is not very large, but it is a harsh method of treatment, attended by great loss of blood and liability to injury of soft parts and bony structures. Recurrence is apt to take place, and the harshness of the procedure is apt to stimulate the tissues to renewed morbid activity.

The curette is rarely available for growths of the size to which these usually attain, although Menocal reports a case successfully treated in this manner, access to the growth having been obtained by a transverse incision, made with the galvano-cautery knife, through the palate. Excision by means of the knife is the most objectionable method of treatment and should never be used, because of the violent hemorrhage which invariably follows.

The potential cautery is not to be recommended.

Electrolysis in the treatment of fibromata of the naso-pharynx offers a very ingenious and attractive method of treatment, but it is still an unsettled question as to how far this method is successful. Cases successfully operated upon by this means have been reported and it would really seem that in this measure we have an exceedingly feasible means of eradicating these tumors, simple in its application, attended with no danger, and ordinarily of little discomfort to the patient, and which, therefore, would seem to be especially applicable when the general health has become so far impaired as to increase the hazard of a radical operation, or even to render it absolutely unavailable. Unfortunately, however, we cannot expect these very satisfactory results in the use of electrolysis in all cases. This plan of treatment is carried out usually by means of long slender needles, attached one to the positive and one to the negative pole of a galvanic battery of moderate strength. These are thrust deeply into the growth, one being inserted into the nasal prolongation, while the other is inserted through the mouth. Paquet noticed, in carrying out this manipulation, that dry gangrene occurred around the positive electrode, while moist gangrene set in about the negative electrode. Each sitting occupies from ten to twenty minutes and is to be repeated in from about five to ten days, according to circumstances.

When it is not convenient to insert both electrodes into the mass of the growth, the negative electrode may be inserted into the neoplasm, while the positive is attached to a sponge applied to the back of the neck.

Undoubtedly the instrument which is best adapted for the removal of the larger proportion of these tumors is the écraseur in some of its forms; and under this term we may include the chain écraseur, the wire-snare écraseur, and the galvano-cautery loop. This latter device was the one so successfully used by Lincoln, and it is the one preferred by many operators. The claim that hemorrhage is avoided in operations with the galvano-cautery snare is undoubtedly true to a certain extent, and yet from a practical point of view it does not control hemorrhage to the extent which is claimed. Furthermore, it is by no means an easy matter to manipulate this instrument. The placing of the soft platinum wire in position is not a simple procedure, and even after the pedicle has been grasped by the loop the ordinary cautery-handle, with the écraseur attachment, is a somewhat bungling instrument to manipulate. Still further, I think it has been the experience of most of us in making use of this device to find that the platinum wire is very fragile, especially when heated to a white heat, and that the operator is not infrequently put to a great annoyance by the breaking of his wire, with the result that all the difficult manipulation of putting it in place has to be undertaken a second time. It has been recommended by a number of operators to use the steel-wire loop, in place of the platinum, in connection with the galvanic battery, on the ground that the wire possesses much greater tensile strength, is more easily manipulated and put in position on account of its rigidity, and that it is quite as easily heated for burning purposes as the softer metal.

The cold-wire snare, it seems to me, offers by far the best means of dealing with these growths, a strong Jarvis snare with a stout steel wire being required. The great advantage of the steel wire, as already suggested, is that the loop possesses sufficient rigidity to enable the operator to carry it into the nasal passages, or into the pharynx, and force it over the tumor; although, of course, if necessary, this manipulation can be materially aided by means of the finger inserted into the pharynx, where it is designed to embrace the growth in that region. Still further, where the growth is of large size, and is composed of a number of prolongations or offshoots, it is often impossible to engage the whole mass by any device. Hemorrhage, except such as may be excited by the manipulation, may be generally avoided, for we may occupy two or three hours, or even

more, if necessary, in separating the mass, thus permanently closing the blood-vessels as we proceed.

Of course, this manipulation is greatly facilitated by the use of cocaine, which should be applied as thoroughly as possible, by means of the spray or by pledgets of cotton wrapped on a probe. We should in all cases endeavor to remove the whole mass at a single operation if possible, but when this is not feasible I see no serious objection to removing the growth piecemeal, especially when this can be accomplished in so simple a manner as that above detailed. After all, each operator will select that method of procedure with which he is most familiar, and in which he is most skilful, and, while not intending to entirely condemn the use of the galvano-cautery loop, it seems to me that where one has familiarized himself with the manipulation of the cold-steel wire, he will in most cases find it a preferable instrument with which to attack growths in the nose and naso-pharynx. The only question which remains to discuss is the advisability of measures for the prevention of recurrence. These consist essentially in the cauterization of the base, after removal of the growth. I know of no statistics bearing directly on this subject, and, furthermore, it is one not easy to decide. A majority of operators, after removal of the tumor, cauterize the base. I think, however, that after the removal of any tumor we should exercise a certain amount of conservatism in subjecting healthy tissues to the action of caustics, whereby a renewed activity of morbid growth unquestionably in certain cases is stimulated. Is it not better to carefully watch the site of the growth, and be governed in our actions by the appearances of the stump, and to act only on the appearance of any indication of recurrence, being confident that, certainly in the majority of cases, this will not be discovered? As to the application of milder remedies, such as Lugol's solution, or some of the milder caustics, such as acetic or chromic acid, I see no objection, although I think the potential cautery should be recognized, in this connection, as a device capable of doing mischief.

CHAPTER XLIV.

MYXO-FIBROMA OF THE NASO-PHARYNX.

This is a term which is used to designate a form of neoplasm composed of fibrous connective tissue, with a more or less copious admixture of myxomatous structure, and which has a clinical history entirely distinct from that of pure fibroma; and, furthermore, springs from the upper portion of one of the oval openings of the posterior nares, where the mucous membrane lining the nasal cavity proper is merged into the structures which we find in the vault of the pharynx. True fibroma, fortunately, is a much rarer occurrence than the myxo-fibroma. The frequency of these growths is scarcely to be judged by the literature of the subject, for many cases are met with in every-day practice which present no symptoms or complications which would render them of sufficient importance for publication. Yet the number of cases recorded is by no means small.

It is difficult to assign any direct cause for these tumors. Sex seems to have a certain influence, two-thirds of the cases reported having occurred in females.

It is usually met with between the ages of fifteen and thirty, although apparently no age is exempt from the affection. Panas' case occurred in a man aged sixty-eight.

Symptomatology.—In the early stages of the development of the growth, the symptoms to which it gives rise consist merely of a certain degree of interference with nasal respiration on the side from which the tumor springs, with some hypersecretion. As the neoplasm increases in size, the nasal stenosis becomes more marked and the voice is affected. Owing to the presence of a large amount of myxomatous tissue in the tumor, it is soft, and develops comparatively rapidly. Hence it very soon impinges upon the soft palate, interfering with its movements in phonation and giving rise to a notable impairment, not only of the quality of the voice but also of clearness of articulation. Deglutition is not notably interfered with; the tumor, being freely movable in the pharyngeal cavity, is lifted by the movements of the palate during this act.

These growths may attain considerable size without giving rise to

any very marked symptoms of discomfort other than the interference with nasal respiration. After it has found a somewhat firm resting-place on the upper surface of the palate, and the pedicle is thereby relieved from the tension of the pendulous mass, the growth seems to assume a lateral direction, and also in part to become arrested, in that its increase in size goes on with much less rapidity and even shows a tendency to stop at this point. The tumor occasionally protrudes itself between the borders of the soft palate and the posterior wall of the pharynx, but usually it is thrown back again into the upper pharynx by the ordinary movements of the palate, and rarely shows a disposition to permanently intrude itself into the lower pharynx, although a case reported by Coyne seems to have been of this nature, in that the lower border of the tumor rested almost on the root of the tongue. Epistaxis is never symptomatic of the fibro-polyp; the ordinary faucial and bronchial symptoms, however, which occur in connection with mucous polypi may be present. In one of the cases which came under my own observation spasmodic asthma was entirely and immediately relieved by the successful removal of the tumor.

Pathology.—The essential basis structure of the tumor is composed of bundles of white fibrous connective tissue, while scattered between the bundles and between the individual fibres is found a large quantity of myxomatous tissue. In addition to this, there are numbers of fibres of yellow elastic tissue scattered throughout the growth. In the outer portions of the tumor, and also scattered between the fibres, are found large numbers of round and spindle cells. The vascular supply is fairly rich in the central and peripheral portions of the tumor, while in the intermediate portions of the growth it seems to be to a certain extent deficient. The pedicle is composed mainly of connective tissue. The tumor seems to be covered by the mucous membrane of the part from which it sprang. The deeper layers of the epithelium are rounded or even flattened as we recede from the surface. The attachment of the growth is, in the large majority of instances, to some portion of one of the oval openings of the posterior nares, usually its upper portion; in one case reported, however, the attachment was to the septum, and in another to the inferior turbinated bone.

The pathological character of the growth would seem to show that it originates as an ordinary mucous polyp, which, having fallen into the pharynx and finding room for a larger development, attains an unusual size. Nevertheless, this idea falls to the ground, it seems to me, absolutely, when we remember that the neoplasm develops invariably from the margin of one of the posterior nares, a region from which, so far as I know, a pure myxoma has never been known to de-

velop. We must regard, then, the tumor as developing primarily as a fibro-myxoma, and maintaining this character throughout its entire career, and simply explain this fact on the ground that it has its origin from a tissue which is the meeting-ground of the nasal mucous membrane and the membrane lining the vault of the pharynx, two regions lined by mucous membrane differing in a marked degree in their histological and physiological characteristics, in one of which the prevailing form of growth is a myxoma and in the other of which the prevailing form of growth is a fibroma. Hence, a tumor springing from a region in which the structures of these two cavities commingle necessarily partakes of the character of each.

Diagnosis.—The neoplasm has a grayish-red aspect, of a muddy tinge, which is presented by no other form of growth met with in this portion of the upper air tract. It should not be confounded with a true fibroid, which is of a whitish-pink tinge that is absolutely characteristic. In addition to this, the insertion of a probe will easily demonstrate the mobility of the growth and render the diagnosis free from all obscurity. When the growth presents below the palate, and is brought under immediate ocular inspection, the diagnosis, of course, presents even less difficulty. In addition to this, it should be borne in mind that a fibro-mucous tumor never gives rise to hemorrhage, facial deformity, displacement or erosion of bone, or any of the grave complications which attend the development of fibroma in the naso-pharynx.

Prognosis.—As before stated, these growths develop somewhat rapidly at first, while subsequently their growth seems to become retarded, or even shows a tendency to arrest, although as regards any tendency to a retrograde process or atrophy, as sometimes occurs in fibroma, this, I think, has never been observed, nor, so far as I know, any disposition to spontaneous separation or sloughing away. After removal they occasionally recur, although this tendency is by no means so marked as in the case of myxomata.

Treatment.—These growths being pendulous in the pharyngeal cavity, and attached by a pedicle usually not larger than three-eighths to a half inch in diameter, their successful removal presents no very serious or great obstacles. If they hang below the border of the soft palate, perhaps the simplest method of extracting them is to seize the pendulous portion by a pair of stout forceps, the blades of which are armed with teeth of sufficient size to prevent the tumor escaping from its grasp, when the whole mass is separated by twisting the forceps in the hand, until the tumor comes away. This process, of course, is much better than simply tearing the growth away, in that by this means the separation is accomplished at its attachment, whereas sim-

ple evulsion might result in unnecessary injury to healthy parts. It is not always feasible, however, to extract these growths by torsion, on account of their size; hence, in order to facilitate the manipulation and to provide more room, it may be necessary to make an incision in the palate. The most rational method of operating is by the snare or écraseur. The main difficulty here, however, consists in the adjustment of the loop. Linon made use of a rather ingenious method of adjusting it, as follows: A Bellocq canula was passed through the nose into the oral cavity, when the ends of the wire were drawn back, leaving the loop in the mouth. A thread was then inserted into the pendulous portion of the tumor by means of a curved needle, and dropped through the loop, traction being exerted on the thread and subsequently on the wires emerging from the nose. The loop in the fauces necessarily was made to pass up over the growth and to adjust itself to the pedicle, whereupon the tube was slipped over the wires emerging from the nose and the pedicle severed by écrasement. Most operators unquestionably nowadays prefer the wire-snare écraseur, constructed on the principle of Jarvis' snare. An instrument of this kind, armed with a steel wire, supplies a loop, which, in the hands of an operator of moderate manipulative skill, can be passed through the nasal cavity, and slipped over a growth even of considerable size without the aid of Linon's ingenious method.

I have had but three cases of myxo-fibroma, in all of which the growth was extirpated by means of the snare and with comparatively little trouble. Of these two came under my observation before the introduction of cocaine, and the operation was done without anæsthesia. The importance of using local anæsthesia in these operations need scarcely be mentioned. I regard the steel-wire écraseur as more feasible and in every way preferable to the use of the galvano-cautery écraseur. The galvano-cautery loop is by no means so easy of adjustment. It presents the possible advantage of cauterizing the base, which is of questionable importance, as fortunately these tumors show but little tendency to recur when thoroughly extirpated, and it is an open question whether even cauterization of the base retards this tendency in any degree.

CHAPTER XLV.

CHONDROMA OF THE NASO-PHARYNX.

Our knowledge of this rare disease is based entirely on the records of two cases, the report of which is appended in sufficiently full detail to afford all necessary information as regards its clinical history, prognosis, and method of treatment.

Case I.—Max Müller reports having observed a case of enchondroma of the naso-pharynx in a young man, aged 29, who gave the history of a tumor of this region which had commenced some five years previously, and which, at its onset giving rise merely to nasal stenosis without secretion, developed by a somewhat slow process, gradually filling up the naso-pharynx, and sending prolongations into both nares, while at the same time it extended down to the level of the soft palate, which was crowded forward into the oral cavity.

The subjective symptoms consisted mainly of headaches, which were of a very severe character, coming on in paroxysms, and lasting from two to four days. Later he became subject to attacks of syncope, due, probably, to disturbance of the cerebral circulation.

Access to the part was obtained by means of Langenbeck's operation of temporary resection of the superior maxilla, and the tumor successfully removed by means of the écraseur. Examination revealed it to be an enchondroma which had its origin from the basilar process. The operation was entirely successful, and there was no history of recurrence.

Case II.—Heurtaux cites a case of a young girl, who for five years had suffered from gradually increasing nasal stenosis, first of the left side, and later of the right. In connection with these, there then developed exophthalmos, amaurosis, and broadening of the dorsum of the nose, giving rise to a certain amount of facial deformity. Examination showed the right nasal fossa to be closed by a deflection of the septum, the result of a tumor in the left nares impinging upon it. The finger introduced behind the palate discovered a hard, dense tumor filling the naso-pharyngeal space. In spite of the firmness of the growth the exploring needle penetrated it easily. An operation for its removal being decided upon, access to the growth was gained by the removal of the left half of the nose. The tumor was found adherent to the floor of the nasal cavity, to the septum, and to the posterior pharyngeal wall, and had invaded also the antrum. Microscopic examination showed the growth to consist almost entirely of hyaline cartilage. The patient made a rapid recovery.

CHAPTER XLVI.

SARCOMA OF THE NASO-PHARYNX.

Malignant disease having its origin in this region would seem to be of exceedingly rare occurrence. Of the two forms, sarcoma is met with much more frequently than carcinoma. And yet in either form, medical literature contains but a limited number of cases.

Etiology.—Sarcoma is usually regarded as belonging rather to the earlier period of life. This is true as compared with carcinoma, and yet in the nineteen cases reported, there occurred:

Between	1	and	10	years	of	age,	.	.	.	2
"	10	"	20	"	"		.	.	.	5
"	20	"	30	"	"		.	.	.	3
"	30	"	40	"	"		.	.	.	2
"	40	"	50	"	"		.	.	.	7

Sex seems to exercise a notable influence, in that fourteen of the cases occurred in males, while but five were in females. This excess is easily accounted for when we consider that sarcomatous tumors belong to the connective-tissue series, and bear a certain relation, therefore, to fibrous tumors, which, as we know, occur almost exclusively in males.

Symptomatology.—In the early stages of the development of these growths, they give rise to no symptoms which differ in any notable degree from those caused by the existence of any form of tumor in this region which has attained sufficient size to impede normal nasal respiration. Offensive discharge manifests itself quite early in the history of the case, and is present in the majority of instances. Epistaxis also is liable to occur somewhat early, although it is not a prominent symptom, occurring in perhaps from one-third to one-half of the cases. The attacks, however, are rarely severe, or frequently repeated, and never become a grave symptom, as in cases of fibroma. The general health suffers somewhat early in the history of the case, due in no small degree to the offensive character of the discharge, which undoubtedly acts in a certain measure to impair digestion, and to vitiate the inspired air. As the growth develops in size, the additional symptoms of difficult deglutition, with recurrent

attacks of dyspnœa, set in. The encroachment of the tumor upon the orifice of the Eustachian tube leads to the early development of impaired hearing, or the complete loss of this function.

Pathology.—The origin of these growths is usually from the basilar process of the occipital bone, starting in the deeper layers of the mucous membrane lining the part, developing in the form of rounded, somewhat lobulated growths, which extend downward, forming a veil, as it were, over the posterior nares, and which more or less rapidly increase in bulk, while at the same time the attachment slowly extends over a larger area. As they develop, they send prolongations into one or both nasal cavities, but the activity of the growth usually seems to be downward, gradually encroaching upon the lower pharynx, and crowding forward the soft palate. They are usually of soft consistency, and do not seem to possess the power of displacing the hard parts or causing their destruction. There have been cases, however, in which the bony structures were invaded. In others, the process extended through the sphenoidal and spheno-maxillary fissures. From the histological point of view, these growths differ in no essential degree from a sarcoma of the nasal cavity.

Diagnosis.—In appearance, these growths are irregular, rounded, and somewhat lobular, of a grayish-yellow muddy-looking color. They have the appearance to the eye of a soft, pultaceous mass, which is verified by palpation with the finger. Their recognition, however, by ocular inspection, can rarely be depended upon, and certain diagnosis can only be made by a microscopical examination.

The character of the tumor having been recognized, it becomes a matter of some importance to determine whether it arises in the nasal cavity or in the naso-pharynx. As regards sarcoma of the nasal cavities, I think it may be stated as a rule, that it shows a marked hesitancy in making its way into the pharynx, and that the mere presence of a tumor, which is ascertained to be of a sarcomatous character, more or less completely filling the pharynx, is a pretty clear evidence that it had its origin in that region.

Course and Prognosis.—A sarcoma, especially in early life, runs a somewhat rapid course, although this rapidity of growth is dependent in no small degree upon the special character of the tumor. In a general way we may state that a tumor composed of small round cells runs an exceedingly rapid course, while the spindle-cell tumor develops more slowly, and in those cases in which there is a large admixture of fibrous tissue the development of the neoplasm is very greatly retarded. On general grounds we must regard the prognosis in these cases as exceedingly unfavorable.

Treatment.—The failure in all cases to even relieve symptoms by

extirpating these tumors by means of a radical operation, and the fact that so many die upon the table warrants us in condemning utterly this procedure. The only question really open for discussion in this connection is as to the comparative merits of the use of the cold-wire snare or the galvano-cautery. The selection of the means, however, must always be decided by the individual preferences of the operator, and the greater skill which his own experience may have given him in the management of any special device. My own preferences are decidedly in favor of the cold-wire snare. In removing a sarcoma by this means, the operation is to be done much in the same manner as that already described in connection with fibromata of this region, with the difference, however, that hemorrhage in connection with sarcoma is not to be anticipated to anything like the extent with which an operation for fibroma is complicated. Of course, if the growth has attained such size as to render simple manipulations with snare impracticable, wider access to the growth may be obtained by slitting the palate, a simple operation, which would scarcely complicate the case; or, if demanded, Bruns' operation or some similar preliminary operation on the external nose must be done. The clinical history of sarcoma shows that recurrence is always likely, and the question therefore arises how it may best be prevented. Much stress has been laid, especially by Lincoln, on the importance of cauterizing the base of the tumor after an operation. I am disposed to think that there is a certain danger in this, especially in the naso-pharynx. Caustic agents cannot be used in this region with impunity, and it has by no means been determined that the use of a caustic may not, instead of destroying diseased tissue, stimulate the parts to a renewed malignant action. The suggestion occurs that we may with more safety depend on watching the parts carefully from time to time, and controlling any tendency to recurrence by the removal of the small masses as they develop, by means of the snare, especially as sarcoma rarely affects the lymphatic glands.

CHAPTER XLVII.

CARCINOMA OF THE NASO-PHARYNX.

The literature of carcinoma of the naso-pharynx is completed, so far as I have been able to learn, in the report of six cases.

In its primary development and subjective symptoms, carcinoma of the naso-pharynx differs in no notable degree from that of sarcoma, causing obstruction to nasal respiration, together with a certain amount of unpleasant discharge, mixed with blood, and the deformity and impairment of function of the fauces according to the size of the tumor. Secondary enlargement of the tissues of the neck occurs comparatively early in the history of the disease, and, furthermore, this infiltration proceeds without much change, and with little tendency to rapid development, for a considerable period of time.

The diagnosis, of course, would be in most instances rendered fairly complete by the existence of this one symptom, although its thorough determination must always depend upon a microscopic examination.

As regards both prognosis and treatment, there is little to be said. The disease is inevitably fatal and runs its course in from one to three years.

The plan of treatment is necessarily one which must be decided by the surgeon in each individual case, or even the question as to whether any treatment at all should be resorted to. In a case under my care, the successful removal of the growth by means of the snare was accomplished with but a trivial amount of pain or even discomfort to the patient, and the relief to symptoms was not only very great for a time, but, furthermore, the patient was made happy for weeks and even months with the idea that her disease was being brought under subjection.

As regards the advisability of a radical operation, such as a resection of the superior maxilla, and procedures of this kind, there would seem to be very little justification for subjecting a patient to this great hazard, from our clinical experience of the disease as at present recorded.

SECTION III.

EXTERNAL SURGERY OF THE NOSE.

EXTERNAL SURGERY OF THE NOSE.

CHAPTER XLVIII.

EXTERNAL SURGERY OF THE NOSE.

Under this heading is embraced a description of those operations by which a larger access to the nasal passages is obtained for the removal of tumors, either of the nasal cavity itself or of the naso-pharynx, and which involve:

(1st) Incisions through the hard or soft palate, or both;

(2d) Incisions through the external integument alone; and

(3d) Incisions through the external integument, together with section of bone.

Under the first group are included the following operations:

Manne's Operation.

This simple operation was first performed by Manne, in order to gain wider access to the naso-pharynx, for the removal of a fibro-myxomatous growth, the size of an egg, which completely filled that cavity, the incision being made through the soft palate, from below upward, by means of a bistoury, in the median line, extending from the tip of the uvula to the junction of the hard palate. Subsequently, Levret, in a somewhat similar case, slit the palate at the side of the uvula, thus accomplishing an equally good purpose, with a shorter line of incision, a proceeding regarded by Jobert as preferable. The operation involves no complications. The parts are subsequently restored by the insertion of one or more sutures, although the tissues would become reunited probably in the majority of cases even without such interference.

Maissonneuve's Operation.

This device consists of making an incision in the median line from the junction of the hard palate down into the body of the uvula as far as may be necessary, thus securing a somewhat wide opening through the soft palate, while at the same time its free border is preserved.

This procedure was originally done by Maisonneuve for the removal of a fibro-vascular tumor, which was succesfully extracted by means of a snare, after which the parts were reunited by a single suture.

Nélaton's Operation.

Following out the method of Manne, the distinguished French surgeon Nélaton devised an operation for the extirpation of growths arising from the basilar apophysis, which he performed as follows:

Fig. 61.—Lines of Bony Section in Nélaton's Operation.

The uvula being seized with a pair of forceps, it, together with the curtain of the palate, was divided exactly in the median line as far as the hard palate; then, with a stout double-bladed knife, this median incision was continued along the hard palate to a point about seven-eighths of an inch from the incisor teeth. From the extremity of this incision the membrane covering the hard palate was incised on either side, directly outward; that is, in a line perpendicular to the first, over a distance of from three-quarters of an inch to an inch. The wound in the hard palate thus assumed somewhat the form of the letter T. A periosteum knife was now introduced, and the mucous membrane covering the hard palate was separated along the line of incision, as far back as the velum. The knife was now passed through the junction of the mucous membrane of the nasal cavity with that of the palate. Next, at the outer extremity of each horizontal incision, a perforation was made through the hard palate, through which one blade of a stout pair of scissors was inserted, and all this portion of the bony palate was removed, together with a portion of the vomer (see Fig. 61), taking care to preserve as much as possible of the mucous membrane covering the upper surface of the fragment,

that is, of the floor of the nose. A large opening was thus formed, which gave easy access to the base of the skull. Moreover, this wound could be kept open for any length of time, and any evidences of recurrence promptly treated and dissipated. After a cure had been effected the margins of the palatine wound could be approximated, and in many cases a certain amount of bone was reproduced, and the contour of the hard palate restored.

Botrel's Operation.

In order to gain a wider access to the naso-pharynx, and still preserve the free border of the soft palate, Botrel combined Maisonneuve's incision of the soft palate with Nélaton's operation just described, of resecting a portion of the hard palate; the steps of the operation need not be entered into, as they differ in no respect from those already described.

Richard's Operation.

This device accomplishes much the same purpose as that of Nélaton, while at the same time the integrity of the soft palate is preserved. The procedure is as follows: An incision is made in the median line, from the posterior border of the hard palate forward to the alveolus, extending well down to the bone, after which the periosteum is dissected up on either side, over the whole area of the bone which it is designed to remove, when the bony palate, to such an extent as may be necessary, is removed by means of a chisel, and free access gained to either one or both nasal cavities, according as may be desired. After the indications for which the operation is done have been fulfilled, Richard apparently leaves the mucous membrane and periosteum *in situ*, without further procedure, although Gussenbauer performed a similar operation subsequently, and inserted sutures for reuniting the flaps of mucous membrane and periosteum.

Sédillot's Operation.

Sédillot makes a linear incision in the median line through the soft palate, by means of a bistoury, extending the incision through the mucous membrane of the hard palate as far forward as the palato-maxillary suture, cutting down to the bone, after which, by means of a periosteum elevator, the oral faces of the palatal process are denuded, and subsequently, by passing up behind the border of the soft palate, its nasal surface is subjected to the same manipulation. After

this, the horizontal plate of the palatal bone is exsected (see Fig. 62), by means of a stout scissors or forceps. By this means, fairly wide access is obtained to the naso-pharyngeal cavity, for such subsequent procedure as may be indicated. The edges of the wound are to be reunited by sutures, with the prospect of complete restoration of the bony parts which have been removed.

Fig. 62.—Sédillot's Operation; Lines of Bony Section.

Dezeanneau's Operation.

This operation was performed by Dolbeau, who assigns to Dezeanneau the credit of having devised it. It was done for the removal of a fibroid tumor in the nasal cavity, and consists in making a complete section through the hard palate, including the soft parts covering it, commencing at its junction with the soft palate, in the median line, and carrying the incision forward to, or beyond, the palato-maxillary suture, when it is carried across at right angles, until it approaches the alveolar process, and is again turned and carried back to the junction of the hard and soft palate, at its alveolar extremity (see Fig. 63). In this manner, a quadrilateral flap, as it were, is formed in the hard palate, which can be depressed in such a manner as to admit of free access to the nasal cavity above, the flap turning on the junction of the hard and soft palate as a hinge.

Fig. 63.—Dezeanneau's Operation; Lines of Section of Hard Palate.

Under the second group are described the following operations:

Dieffenbach's Operation.

This operation is designed to obtain a wider access to the anterior nares, for the removal of such growths in this region as do not admit of extraction through the natural passages, and although perhaps previously suggested by Dupuytren, it was first performed by Dieffenbach. It consists in making an incision which, commencing at the

lower and outer angle of the nostril, is carried along the base of the nose, in the naso-labial fold (see Fig. 64), until the ala of that side can be easily turned upward and inward, thus exposing the whole of the anterior chamber and lower meatus, with a portion of the middle meatus. If it is necessary to expose both cavities, the same operation can be done on the opposite side, the opening being notably enlarged by separating the columna, by an incision through the integument at the labio-columnar fold.

The proceeding is attended with no special danger or complication, the hemorrhage being slight. The parts reunite readily, although Dieffenbach advises the insertion of sutures.

Fig. 64.—Dieffenbach's Operation; Line of Cutaneous Incision.

Fig. 65.—Lariche's Operation; Lines of Cutaneous Incision.

Lariche's Operation.

A somewhat similar device was that of Lariche, who in order to remove a tumor involving the lower portion of the cartilaginous septum, made a V-shaped incision having its ends in the lower border of either nostril, while the apex was in the median line perhaps a quarter of an inch below the columna. In this manner the columna was separated from the upper lip and the lower border of the septum (see Fig. 65). This being turned upward, the lower portion of the septum, together with the growth, was removed with

scissors, and the columna subsequently restored to its position, and held in place by sutures.

Rouge's Operation.

(See Colored Plate I., Fig. I.)

This operation was first devised by Rouge, in order to gain freer access to the nasal cavities in a case of syphilitic ulceration and necrosis, and is performed as follows: The patient being turned on his side, to facilitate the escape of blood, the upper lip is seized firmly by an assistant, and drawn up over the nose in such a way as to thoroughly expose the gingivo-labial fold, when an incision is made through the mucous membrane, extending from the first molar tooth on one side to the same point on the opposite side, after which the lip and face are dissected from the bones, until the lower border of the anterior nares is exposed, and the septum reached, which is now divided by means of a stout pair of scissors, in sufficient extent to allow of the nose being turned up over the face, in such manner as to more or less completely expose the bony openings of the nasal passages. If necessary, the cartilaginous septum may be completely divided, in order to faciliate the rolling backward, as it were, of the lower part of the face. The facility of access to the nasal cavities thus gained is practically limited only by the size of their bony openings anteriorly. For convenience of manipulation and ease of illumination therefore, the gain is no small one, especially when we consider the comparative simplicity of the operation, which, according to Rouge, is accomplished without any dangers, and with no great risk of complications. The hemorrhage is comparatively slight, the reaction not notable, and, furthermore, after restoration of the parts, union is complete in one or two days, the patient suffering but trivial discomfort as the result of the operation. The field of operation might undoubtedly be further enlarged, without complicating the procedure, by temporarily resecting one or both nasal bones, and perhaps removing a portion of the septum.

Palasciano's Operation.

This operation is interesting only as illustrating one of the curious devices which occasionally originate in the minds of surgeons. It consists of making an incision through the integument over the lachrymal sac (see Fig. 66), which is partially dissected out, when a puncture is made through the os unguis, and access gained to the

superior meatus through the opening, when a canula carrying a ligature is inserted, which, in some manner, is arranged around the pedicle of a polyp, which, being separated in this manner, is extracted through the natural passages. Four cases are reported by Palasciano and Rampolla as having been operated upon in this manner, though with poor results.

Under the last group the following operations are embraced:

FIG. 66.—Line of External Incision in Palasciano's Operation.

BOECKEL'S OPERATION.

This operation is designed to obtain a wider access either to the nasal cavity or to the naso-pharynx, and consists of a temporary resection of the whole body of the external nose, in the following manner: An incision is made across the bridge of the nose, from one lachrymal sac to the other, the cut being carried well down to the bone. A second incision is then made, commencing at one extremity of the primary incision, and carried along the nasal furrow, down to the margin of the nostril, which it opens. A third incision separates the columna from the upper lip (see Fig. 67). The bones in the line of the first incision are now divided by means of a chain saw, which is entered through a puncture made directly through from the one side to the other. The bones in the line of the second incision are then divided by means of a saw (see Fig. 68), after which the septum opposite the line of the primary incision, or as far back as it can conveniently be done, is separated by means of stout scissors or cutting forceps. The whole body of the nose is now turned over upon the cheek of the opposite side by means of a stout pair of forceps, thus fracturing the nasal process of the superior maxillary bone on that side. If, however, there is too much resistance, this part can be weakened or severed on the inner side, by means of a chisel. In this manner, free access to the nasal passages is obtained, but if it is desired to gain a larger access to the naso-pharynx, the additional step may be taken of complete resection of the vomer, and the turbinated bones also if necessary.

After the removal of the growth for which the operation was done, the nose is placed in position, and held by sutures through the integument in the line of the original incisions. The parts reunite readily, without deformity, the cicatrix being scarcely noticeable. The

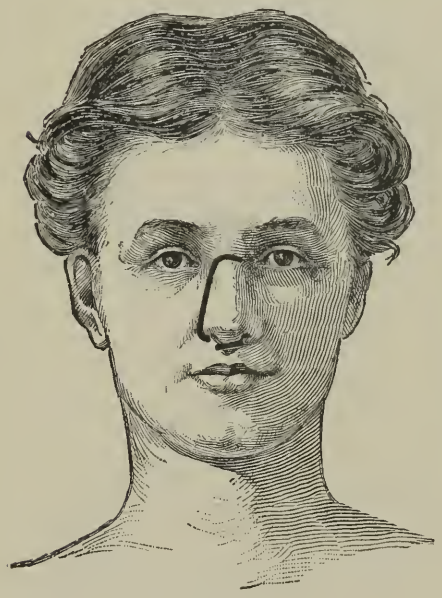

FIG. 67.—Line of Cutaneous Incision in Boeckel's Operation.

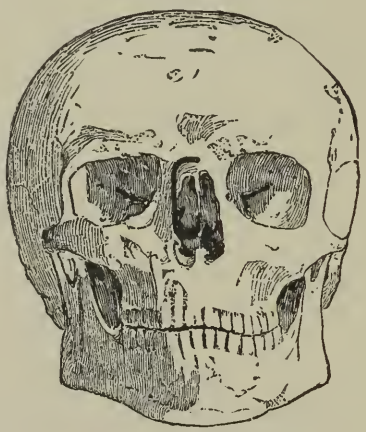

FIG. 68.—Line of Bony Section in Boeckel's Operation.

procedure is a comparatively simple one, and involves no great danger or complications, but few vessels requiring ligature.

OLLIER'S OPERATION.

(See Colored Plate II., Fig. I.)

This operation was first performed upon a patient suffering from a naso-pharyngeal fibroma, which, completely blocking the naso-pharynx, rendered nasal respiration impossible, and by pressure had partly destroyed the vomer. An incision was made, beginning just above the ala of the nose, extending upward to its root, thence across this, and downward to a corresponding point on the opposite side of the nose (see Fig. 69). The incision divided all the parts down to the bone. A thin-bladed saw was then made to divide the nasal bones and the septum, in the line of the cutaneous incision (see Fig. 70). The nose, thus freed from its attachment, was tilted downward upon the face, thus giving free access to the nasal cavity, and through

this to the vault of the pharynx. The tumor was removed in a number of pieces, by means of forceps, the nasal cavities being thoroughly explored with the finger for any traces of the growth remaining in them. The nose was then replaced, and held in position by metallic sutures, the periosteum not being included in the sutures. The nasal

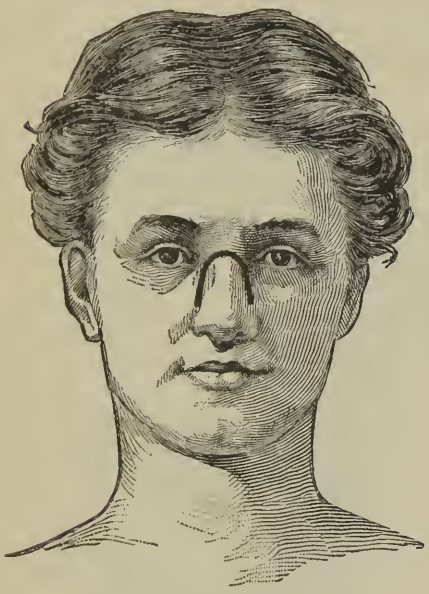

FIG. 69.—Line of Cutaneous Incision in Ollier's Operation.

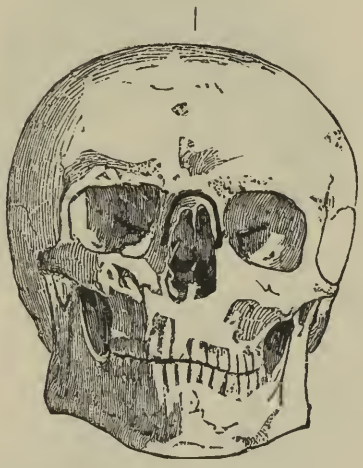

FIG. 70.—Line of Bony Section in Ollier's Operation.

fossæ were filled with sponges, to prevent hemorrhage. Primary union took place through almost the entire wound, and the patient was discharged cured in about six weeks.

LAWRENCE'S OPERATION.

This operation is designed to accomplish the same purpose as those of Ollier and Boeckel, differing from them only in this feature, that the body of the nose is tilted upward upon the forehead. It is done in the following manner: An incision through the integument is made with a scalpel, extending from the lachrymal sac of one side, along the nasal furrow, to the margin of the nostril, which is opened. A second incision is made upon the opposite side, and in the same line, and lastly the columna of the nose is divided at its junction with the upper lip (see Fig. 71). Subsequently, by means of a stout pair of scissors or bone forceps, the bone in the line of each lateral

incision is divided, from below upward, while the septum is divided in the same way (see Fig. 72). The nose is now seized with a stout pair of forceps, or the fingers, and turned bodily up upon the forehead, thus breaking up the suture between the nasal bones and the internal angle of the frontal, which thus acts as a hinge, as it were, upon which the whole mass turns. After the removal of the tumor, the nose is placed in position and held by sutures, union taking place readily, without deformity. It should be stated, however, in regard

FIG. 71.—Line of Cutaneous Incision in Lawrence's Operation.

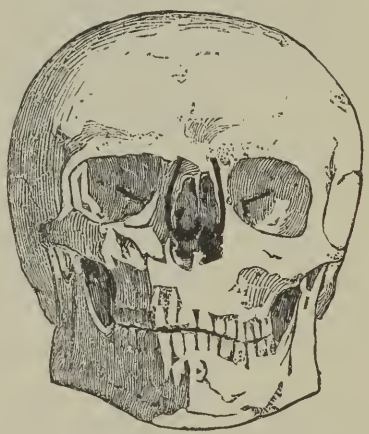

FIG. 72.—Line of Bony Section in Lawrence's Operation.

to this operation, that while accomplishing the same purpose as those of Boeckel and Ollier, it involves a somewhat greater risk, in that, the pedicle being so small, there is a possible danger of perfect circulation not being restored to the parts after the operation, and hence sloughing of the flap might occur.

LANGENBECK'S OPERATION FOR RESECTION OF THE NASAL BONE.

This was done in order to gain access to the anterior nasal passages, by temporary resection of the bony lateral wall of the nose, as follows: A primary incision, by means of a bistoury, is made, commencing in the median line, just above the root of the nose. This is carried across the bridge of the nose, and down one side,

and extended along the middle of the nasal bone, till it reaches the ala (see Fig. 73), after which the cutaneous flap is dissected up by means of an elevator, until the nasal bone, covered with its periosteum, is laid bare in its whole extent. The ala is then separated from the nasal bone, and a forceps inserted through the opening, and the nasal bone separated from its fellow along the median line. The forceps is now inserted at the outer angle of the lower incision, and a section made directly up through the nasal process of the superior

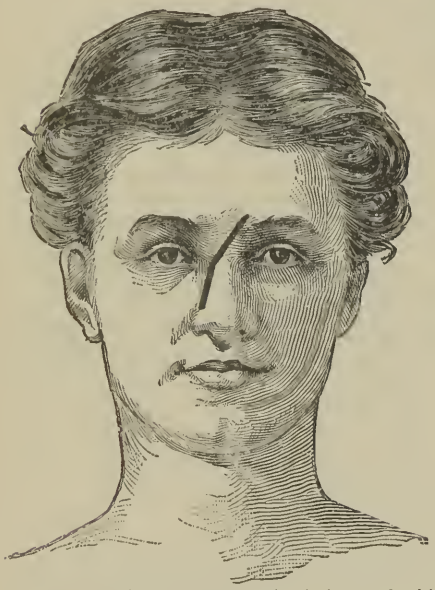

Fig. 73.—Line of Cutaneous Incision in Langenbeck's Operation.

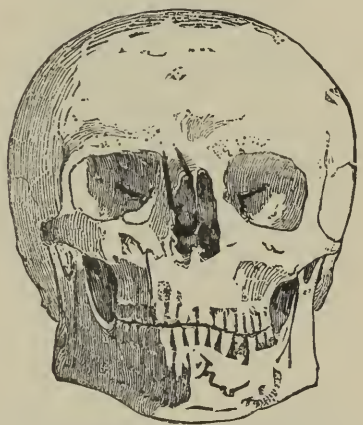

Fig. 74.—Lines of Bony Incision in Langenbeck's Operation.

maxilla, extending toward the inner canthus, until the orbit is reached (see Fig. 74), thus making a small opening into the antrum of Highmore. The piece thus separated is now seized with forceps and turned directly up over the eye. In this manner a comparatively wide opening is made into the nasal cavities, and, if necessary, access obtained to the naso-pharynx. When the design of the operation has been accomplished, the parts are restored to place, and held by sutures through the integument. This operation is attended with no special danger or complications.

This procedure was subsequently modified by Langenbeck (see Colored Plate III., Fig. I.), in that instead of the single incision through the integument, two incisions were made, one along the anterior and another along the posterior border of the nasal bone, coming down to the ala, at which point they were united by an antero-

posterior incision, separating the ala from the lower border of the nasal bone (see Fig. 75). The bone was then divided along the line of the cutaneous incision, and the osteo-cutaneous flap was turned upward, securing the same opening as in the first operation.

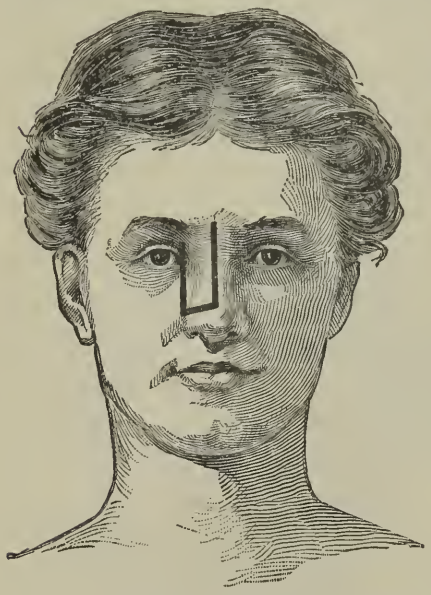

Fig. 75.—Lines of Cutaneous Incision in Langenbeck's Later Operation.

Linhart's Operation.

This operation is designed to gain access to the anterior nares, and is performed by making a linear incision from the root of the nose to its tip, which is then extended into the nostril of one side, after which the nasal bone is seized by forceps and turned forcibly to one side, after separating its attachment to its fellow.

Bruns' Operation.

(See Colored Plate IV., Fig. II.)

The first incision commences just below the outer margin of the nostril of the healthy side, and is carried directly across in a horizontal line, to from half to three-quarters of an inch beyond the margin of the opposite nostril. The incision is carried fully down to the bone, care being exercised not to puncture the mucous membrane of the gingivo-labial fold. A second incision is made directly across the narrowest part of the bridge of the nose, the terminus being just above each inner canthus. A third incision joins the outer extremities of those two, thus extending into the cheek, somewhat beyond the nasal furrow (see Fig. 76). A saw is now inserted at the point of origin of the first incision, its tip being carried into the nasal cavity. A section is made through the anterior nasal spine and the septum, and the saw carried throughout the whole extent of the original line of incision, the section being confined entirely to the superior maxilla, cutting through also the septum and the anterior portion of the lower turbinated bone (see Fig. 77). What Bruns accomplishes here is an enlargement of the original bony opening of the anterior

nares, sawing out a strip of bone, as it were, from a quarter to three-eighths of an inch wide, surrounding this opening. In order to accomplish this, as we see, the free end of the saw plays in the nasal cavity, the instrument being tilted, as it were, in this direction, thus making a bevelled cut. After the primary section is made with the saw, the bony septum is cut by means of a stout forceps or scissors from below upward, and the whole nose seized with the fingers or forceps and turned bodily over on the cheek. This operation of

FIG. 76.—Lines of Cutaneous Incision in Bruns' Operation.

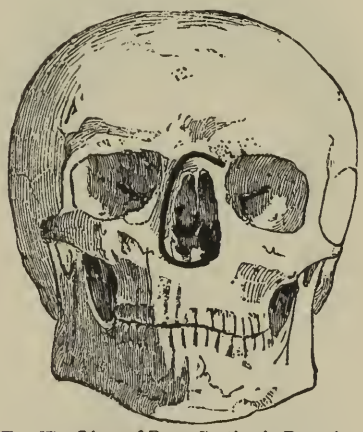

FIG. 77.—Lines of Bony Section in Bruns' Operation.

Bruns is very simple and yet very ingenious, as by this means he obtains a wide access to the nasal passages, and, if necessary, to the naso-pharyngeal cavity, for the removal of neoplasms or the carrying out of other indications. No vessels of any size are encountered during the steps of the procedure, and the operation may be finished without notable complication. After the indications have been fulfilled, the parts are restored to position and held in place by sutures through the integument.

It might be noticed that in one of Bruns' operations the wound was left open for a period covering three weeks, for the purpose of treating the stump of the growth, at the end of which time, the edges being somewhat freshened, they were easily and successfully reunited by sutures.

Fournaux-Jordan's Operation.

An operation which accomplished much the same purpose as that of Bruns, and in a much more simple manner, is that devised by Fournaux-Jordan, and which is done as follows: A sharp-pointed bistoury being inserted into the gingivo-labial fold, just below the posterior margin of the nostril, it is carried forward into the nasal cavity, after which the whole of the upper lip, including the margin of the nostril, is severed by cutting upward. The ala of the nose is now cut through, in a similar manner, in a line continuous with that of the first incision, and the cut extended along the lateral face of the nose, to a point just below the inner angle of the eye (see Fig. 78). The flaps, being now drawn to one side and the other, reveal freely the bony orifice of the anterior nares, which can be enlarged by means of the rongeur, or other suitable instrument, to such size as may be demanded for the special manipulation for which the operation is done.

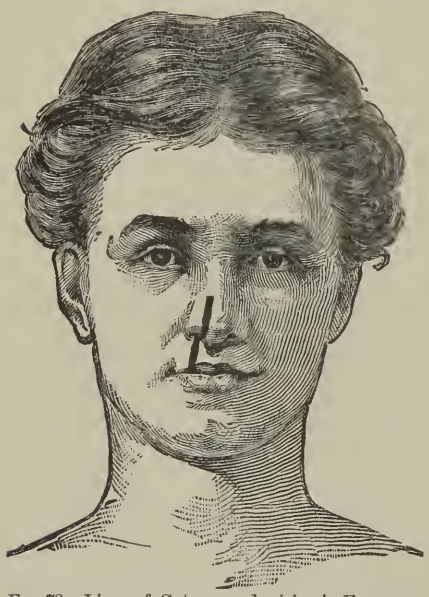

Fig. 78.—Lines of Cutaneous Incision in Fournaux-Jordan's Operation.

Huguier's Operation.

This procedure is designed to gain access to the naso-pharyngeal cavity, and consists of a temporary resection or depression of the lower portion of the superior maxillary bone. The mouth being opened, a transverse slit is made through the soft palate on the affected side, at its junction with the hard palate, after which, by means of a Bellocq's sound, a strong ligature is passed through the inferior meatus, thence through this slit in the soft palate, and finally drawn out through the mouth. The two ends of the thread are then tied together. An incision is then made from the commissure of the lips on the affected side, through the whole thickness of the cheek, outward to the anterior border of the masseter muscle. A second incision is made from the upper border of the ala of the nose on the affected side, along the nasal furrow, separating the ala from the nos-

tril, and is prolonged in the median line, through the whole thickness of the upper lip, through its free border (see Fig. 79). The large triangular flap thus formed is then dissected up, exposing the entire anterior surface of the lower half of the superior maxillary bone. The first incisor tooth on the affected side is then drawn, and by means of a bone forceps, one blade of which is introduced into the nostril, the alveolus is cut through. A flat-bladed saw is then passed into the nostril, and the entire hard palate is sawed through, care being taken not to injure the oral periosteum. The finger is inserted at

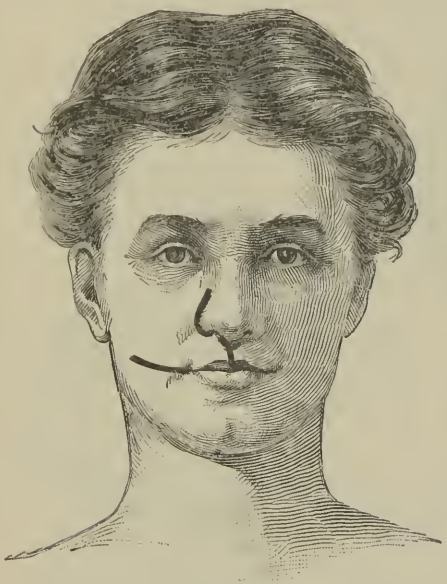

FIG. 79.—Lines of Cutaneous Incision in Huguier's Operation.

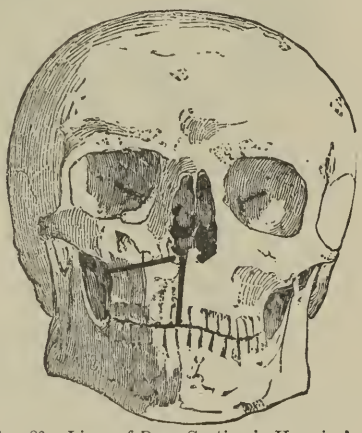

FIG. 80.—Lines of Bony Section in Huguier's Operation.

the posterior extremity of the first incision, and the tuberosity of the superior maxilla is felt. Directly behind this is felt the projecting pterygoid process of the sphenoid bone, which is cut off by means of bone forceps. A narrow-bladed saw is then introduced behind the tuberosity of the superior maxilla, and the body of this bone is sawed through from behind forward, the section being made into the inferior meatus of the nose (see Fig. 80). Traction downward is then made by means of the ligature previously passed through the nostril and through the opening in the palate, and the entire lower half of the superior maxillary bone is depressed into the mouth, hinging upon the undivided oral periosteum of the hard palate. Free access is thus gained to the pharyngeal cavity, as well as to the antrum. The cutaneous incisions necessitate the application of ligatures to the facial

artery at two points. Aside from this, no vessels of any considerable size are divided. The bony and soft parts can be replaced, and the displaced bone may or may not be held in position by means of metallic sutures, according to the choice of the operator. The wounds in the soft parts are closed by means of sutures, and union readily takes place. It is ordinarily necessary for the patient to wear an obturator in the mouth for some time to prevent displacement of the bony fragment.

The above description is taken from Huguier's original report, and is that of an operation which was done for the removal of a

FIG. 81.—Line of Cutaneous Incision in Cheever's Operation.

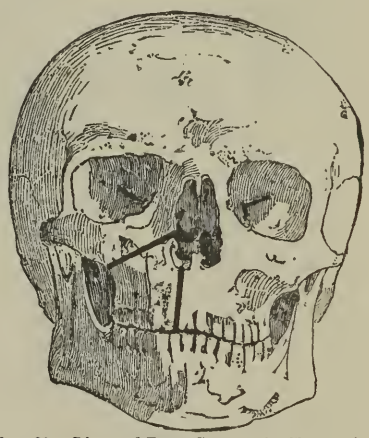

FIG. 82.—Lines of Bony Section in Cheever's Operation.

fibroid tumor of the naso-pharynx. In this case, however, considerable bony necrosis resulted, which marred the success of the operation, bony reunion not having taken place at the end of three years, and all the teeth of that side having become carious. This result was undoubtedly due largely to the fact that the pedicle consisted simply of the periosteum of the oral face of the hard palate, and that this had been subjected to the risk of injury by sawing through the bone from above, with a straight saw.

CHEEVER'S OPERATION.

This accomplishes the same purpose as that of Huguier, in a much simpler and certainly in a much safer manner. The external

incision is confined to one simple cut, extending from just below the inner canthus of the eye on the affected side, to the outer angle of the mouth (see Fig. 81), after which the anterior face of the lower portion of the superior maxilla is exposed, by dissecting up the flaps and drawing them to one side. The next step consists in the extraction of the first incisor tooth on the affected side, after which the alveolus is cut through by means of a bone forceps. The finger is now passed behind the body of the upper jaw, and the tuberosity being located, a straight saw is passed behind this, and worked up along the ptery-

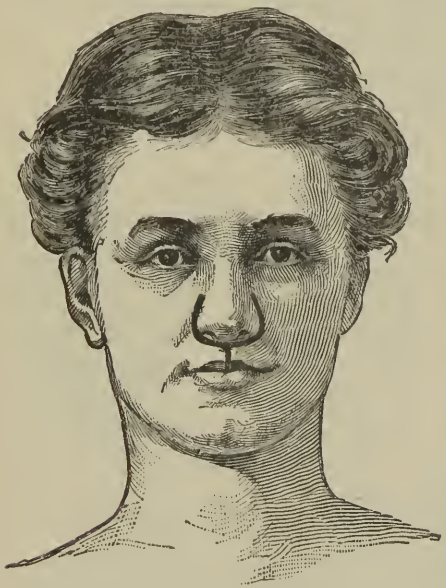

FIG. 83.—Lines of Cutaneous Incision in Cheever's Double Operation.

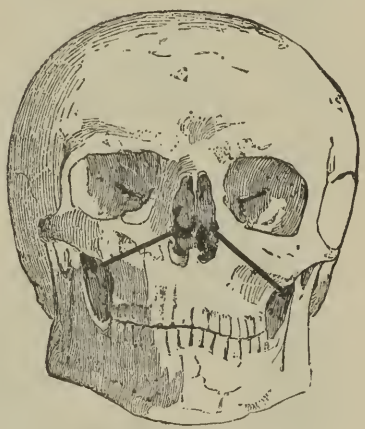

FIG. 84.—Lines of Bony Section in Cheever's Double Operation.

go-maxillary junction, and brought forward, thus severing the body of the bone (see Fig. 82). The mass is now seized with the forceps and depressed, thus fracturing the hard palate. In this manner the whole mass drops into the oral cavity, thus opening a wide access to the naso-pharynx.

The advantages of this procedure over that of Huguier consist in the fact that a more complete circulation is maintained through the hard and soft palate, and also through the posterior palatine vessels which pass through the pterygo-maxillary fissure.

CHEEVER'S DOUBLE OPERATION.

(See Colored Plate II., Fig. II.)

This consists in the depression or temporary resection of the lower

halves of both superior maxillary bones at the same time, and is performed as follows:

An incision, commencing just below the inner canthus of the eye, is carried downward along the nasal furrow, to the base of the nose, when it is carried around the margin of the nostril, which it opens, to the median line, and extended down through the upper lip. A similar incision is made on the opposite side, until it meets that already completed (see Fig. 83). The triangular flap is dissected from the anterior face of each superior maxillary bone, until the lower portion is completely exposed. The superior maxillæ are next cut through from behind forward, the saw being carried so that it emerges in the middle meatus of the nasal cavity (see Fig. 84). The septum is now completely divided from before backward, by means of scissors, when the mass is depressed into the mouth, hinging on the pterygoid processes behind.

Waterman's Operation.

Waterman, for the purpose of removing a nasal growth, resorted to a procedure very similar to that of Cheever, of depressing the lower portion of the jaw, only that after having exposed the face of the bone, and having made an incision in the median line through the hard palate, and also a lateral bony incision above the alveolus, the fragment was depressed in such a manner as to hinge upon the hard palate posteriorly, in much the same manner as in Cheever's double operation. The steps of the operation do not differ in any essential manner from those of Cheever's.

Fig. 85.—Lines of Cutaneous Incision in Roux's Operation.

Roux's Operation.

This rather curious operation consists of a temporary resection of the superior maxilla, in which the external incisions are confined to those points at which the bony sections are made for severing the bone from its attachments.

First Step.—Division of the fronto-malar attachment.

For this purpose, a horizontal incision over this articulation, about half an inch in length, is made with a scalpel, and carried well down upon the bone. Then, by means of a chisel or chain saw, the frontal process of the malar bone is cut through to the spheno-maxillary fissure.

Second Step.—A vertical incision of the same length is made over the zygoma, which is cut through in a similar manner.

Third Step.—An incision is made from the inner canthus of the eye, along the nasal furrow, around the base of the nose, stopping at

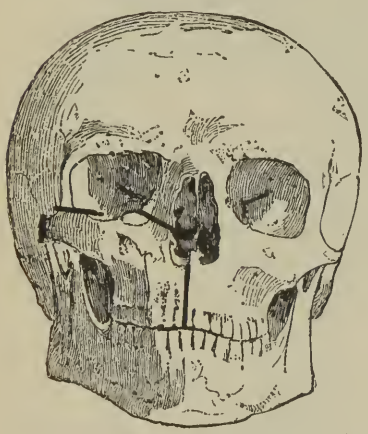

FIG. 86.—Lines of Bony Section in Roux's Operation.

FIG. 87.—Line of Bony Section of the Palate in Roux's Operation.

the columna; or, the incision may be extended through the median line, completely dividing the upper lip (see Fig. 85), after which, by means of a chain saw or scissors, the whole wall which separates the nasal cavity from the orbit is cut through (see Fig. 86), the section extending into the spheno-maxillary fissure.

Fourth Step.—This consists of separating the pterygo-maxillary articulation, by means of a stout pair of scissors, carried up behind the tuberosity of the superior maxilla, this procedure being facilitated, of course, by sliding back somewhat the flap of the integument, and operating through the oral cavity.

Fifth Step.—The hard and soft palate are now separated on the same side by a transverse incision, after which the first incisor tooth is drawn and the hard palate, together with the alveolus, completely divided by means of the saw (see Fig. 87).

The superior maxilla is thus completely separated from all its bony attachments, and is simply held in place by the soft palate and

external integument. The further procedure consists of inserting a pair of stout flat-bladed forceps into the line of incision through the hard palate, when by forcibly opening its blades the whole body of the upper jaw is forced laterally and upward into the temporal fossa, thus securing a fairly wide opening through the hard palate into the nasal cavity and naso-pharynx, for the removal of growths in this region, or for such other indications as may be demanded, after which the parts are easily restored to position, and secured by means of sutures in both the hard and soft parts.

Roux states that a space half an inch in width is secured by this means, for operating in the cavities above. He further adds, however, that this may be somewhat increased by cutting off the pterygoid process at its base, and also removing a portion of the vomer. If necessary, the same temporary resection may be performed simultaneously on the opposite side.

This operation would scarcely seem to afford as free an access to the nasal and naso-pharyngeal cavities as can be obtained by Cheever's, or even some of the simpler operations. Furthermore, although no large vessels are encountered during the operation, hemorrhage from the smaller vessels might occur, and be of such a nature as to render its arrest by no means an easy matter.

Annandale's Operation.

In order to gain access to the naso-pharynx for the removal of neoplasms, Annandale exposes the anterior nares, as in Rouge's operation. The septum is then divided throughout its entire extent, where it unites with the superior maxillæ. Next, the soft parts covering the hard palate are divided in the median line; the soft palate may or may not require division, according to the extent of the growth. The hard palate and alveolus are then cut through in the median line, and the two jaws separated by prying them apart. The amount of separation obtainable varies from one-half to one inch. The growth is then removed by forceps or the snare, the parts are replaced, and held in position by sutures through the alveolus and palate.

Langenbeck's Operation for the Temporary Resection of the Upper Portion of the Superior Maxilla.

(See Colored Plate IV., Fig. I.)

This operation is really designed to obtain access to tumors invading the spheno-maxillary fossa, and yet is very properly recorded

in this connection as one of the means by which access is gained to the naso-pharyngeal cavity. It consists of a temporary resection of the upper portion of the superior maxillary bone, and is performed in the following manner: By means of the scalpel, a curved incision is made through the integument, commencing at the lower border of the nasal bone, and carried outward with a downward curve, beneath the prominence of the malar bone, until it reaches the middle of the zygoma. A second incision, commencing just below the inner can-

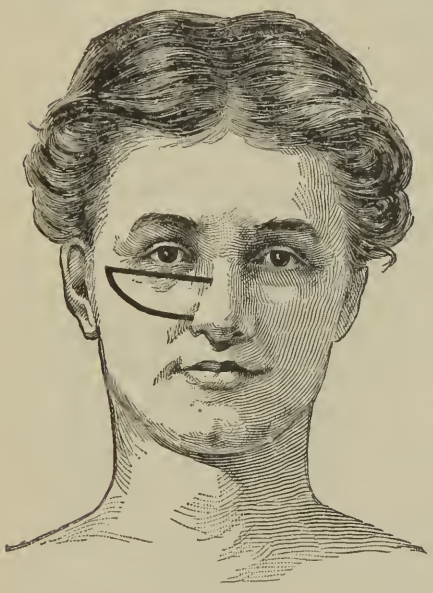

FIG. 88.—Lines of Cutaneous Incision in Langenbeck's Operation.

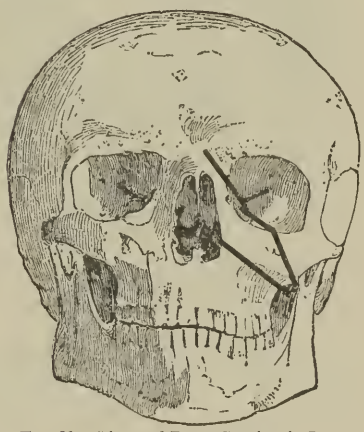

FIG. 89.—Lines of Bony Section in Langenbeck's Operation.

thus of the eye, is carried along, immediately below the border of the orbit, horizontally and outward, until it meets the first incision (see Fig. 88). These incisions are carried well down to the bone. At the point at which the incisions meet, the finger is inserted directly into the spheno-maxillary fossa, the spheno-palatine foramen being usually dilated by the growth, in many cases allowing the finger to pass directly into the pharynx. A straight saw is then inserted through this opening, its movement being guided by the finger in the mouth, when the body of the superior maxillary bone is cut directly through, first in the line of one incision, and subsequently in the line of the other, the section being carried completely into the nasal cavity (see Fig. 89). An elevator is now introduced behind the mass, which is pried out of its position and turned directly inward over the eye of the opposite side, thus hinging upon the nasal process of the

superior maxillary bone and the external flap, which, it will be noticed, is not dissected from the bone.

If the lower of the two primary incisions is made to commence at the ala of the nose, instead of the upper border of the ala, the operation may be to an extent facilitated, in that in this case the section of bone can be made from within outward and from before backward, the saw being inserted into the nasal cavity.

In making the primary incisions it should be borne in mind that

FIG. 90.—Lines of Cutaneous Incision in Billroth's Operation.

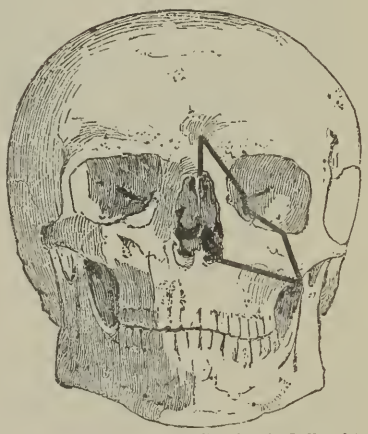

FIG. 91.—Lines of Bony Section in Billroth's Operation.

the facial artery is severed by the lower cut, which, therefore, should be made first, and the hemorrhage properly arrested. This complication is to an extent avoided by an incision which commences at the lower border of the nasal bone. Aside from this, the operation is not attended with any notable hemorrhage, unless it be dependent on the neoplasm itself, for the removal of which the operation is done. The fragment is easily replaced, and need only be secured by sutures through the soft parts.

BILLROTH'S OPERATION FOR THE TEMPORARY RESECTION OF THE SUPERIOR MAXILLA.

An incision is made with a bistoury through the integument, commencing at the root of the nose and extending in the median line to

its tip, when it is carried into the nostril, upon the side on which the operation is to be performed. A second incision is made, commencing at this nostril and extending horizontally across the cheek, for about an inch and a half, to near the anterior border of the masseter muscle. A third incision, commencing at the root of the nose, is carried outward, just below the margin of the orbit, parallel with the lower incision, and to the same length (see Fig. 90). The nose is now severed by means of a chisel or other instrument in the line of the median incision, after which, by means of a straight saw, the body of the superior maxilla is completely divided from within outward, in the line of each horizontal incision (see Fig. 91). The whole mass is now pried out of its position by means of a leverage, acting in the nasal cavity, and turned outward upon the cheek, hinging upon the pterygoid process. The line of incisions through the bone in this operation is much the same as in Langenbeck's operation; hence, the source of hemorrhage is largely in the facial artery, which requires ligation. The course of the upper incision lies very near the infra-orbital foramen. This, however, is avoided with a little care; otherwise, troublesome hemorrhage might arise from the artery, which emerges at this point. The restoration and securing of the fragment in position after the completion of the operation, is, of course, a simple matter.

Boeckel's Operation.

Boeckel, in operating upon a case of naso-pharyngeal fibroma, adopted essentially Billroth's method, with some minor changes, although reporting it as a new operation.

It may be noted that, instead of carrying his saw completely outward in the upper section of the bone, he stops at the infra-orbital foramen, and then, in order to avoid the danger of wounding the artery, inserts the needle of the chain saw through the spheno-maxillary fissure, carrying it subcutaneously until it passes through the spheno-maxillary fissure and emerges at his lower incision, when he divides the union between the malar and superior maxillary bones subcutaneously, after which the remaining portion of the floor of the orbit is divided by scissors.

Demarquay's Operation.

This distinguished surgeon performed the operation which bears his name for the first time upon a patient aged forty-nine, a female, suffering from a naso-pharyngeal tumor which had invaded the antrum and the left nasal fossa. The operator was deterred from mak-

ing an incision on the dorsum of the nose on account of the age and the poor condition of the patient. An incision was made from the internal angle of the left eye, following the nasal furrow, to the free margin of the nostril. From this point a horizontal incision was carried outward to the anterior border of the masseter muscle (see Fig. 92). Two flaps were thus formed, a nasal and a malar.

These two being dissected up, together with the underlying periosteum, Liston's forceps were applied, and the portion of the nasal

Fig. 92.—Lines of Cutaneous Incision in Demarquay's Operation.

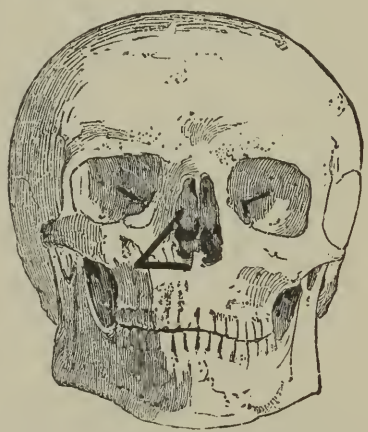

Fig. 93.—Lines of Bony Section in Demarquay's Operation.

process of the superior maxilla and the entire anterior wall of the antrum were removed, enough of the nasal process being left to retain the shape of the nose (see Fig. 93). The tumor was then extirpated by means of forceps, and the margins of the wound brought together with metallic sutures. The patient was cured with scarcely any disfigurement, and the anterior wall of the antrum was reproduced.

Maisonneuve's Operation.

(See Colored Plate I., Fig. II.)

The operation of Maisonneuve, first proposed in 1860, has never been specially improved upon. This operation is done without making any external incisions whatever through the integument, although,

if necessary, the upper lip may be divided from the margin of the nostril to the free border on the affected side. The lip being drawn well up over the nose, the anterior surface of the lower portion of the bone is exposed by sweeping the scalpel along the gingivo-labial fold, until the bony opening of the anterior nares is exposed. The soft palate is separated by a transverse incision from the hard palate, and then, a first incisor tooth having been drawn, the whole of the hard palate, together with the alveolar process, is divided by means of bone forceps introduced through the nostril (see Fig. 94). Then, with the one blade of the cutting forceps introduced into the nostril and the other applied externally along the anterior face of the bone, the whole mass is severed, the section being carried back as far as

FIG. 94.—Line of Bony Section in Maisonneuve's Operation.

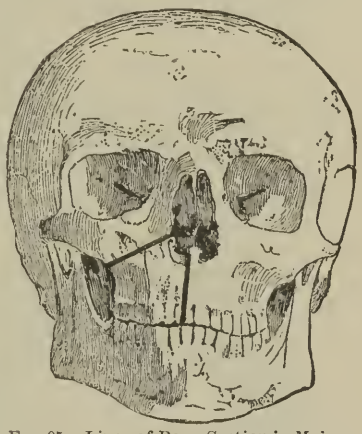

FIG. 95.—Lines of Bony Section in Maisonneuve's Operation.

the tuberosity, at its junction with the pterygoid process (see Fig. 95). The fragment is now seized by forceps and wrenched from its position. This procedure is attended with no notable hemorrhage, aside from that which is dependent upon the character of the tumor or other complications. It gives ample access to the nasal and naso-pharyngeal cavities for the removal of such tumors as may exist there, and a large freedom of movement for subsequent manipulations. At the expiration of a few weeks, an artificial palate is worn with comfort, and subsequently a set of false teeth adapted to that side. The deformity resulting from this operation is very slight ordinarily, and the only objection that lies against it is the loss of the teeth on that side, a defect easily remedied. The very great advantage of the operation over temporary resection lies in the fact that permanent access is gained to the nasal or naso-pharyngeal cavity, for the treatment of the stump, for the observation of any ten-

dencies to recurrence, and for the prompt application of such remedies as may be indicated. Hence, when we remember that this operation is done in the large majority of instances for fibromas of the naso-pharynx, and that these are met with in young children, in whom there is a marked tendency to recurrence, it would seem in every way that indications are best carried out, when a radical operation becomes necessary, by the performance of a permanent rather than a temporary resection. As regards sarcoma, of which recurrence is to be expected almost with certainty, the successful eradication of the growth certainly can be far better hoped for by the permanent removal of a portion of the jaw, for after removal of a growth of this kind the most constant and observant watchfulness is required, if we expect successfully to control its subsequent development.

Péan's Operation.

(See Plate III., Fig. II.)

This consists of a permanent resection of the posterior portion of the lower half of the superior maxilla, and is performed as follows:

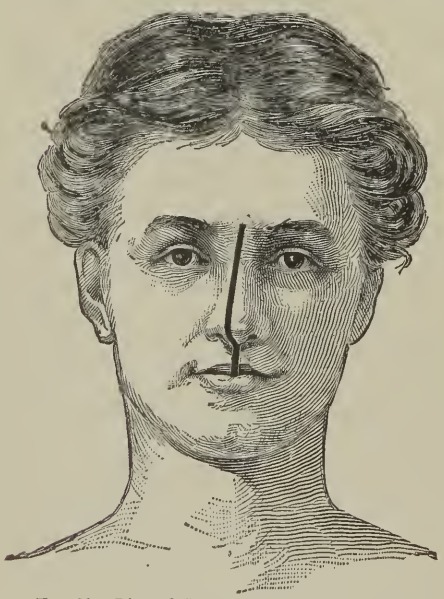

Fig. 96.—Line of Cutaneous Incision in Péan's Operation.

A linear incision, commencing at the root of the nose, is made in the median line, by means of a bistoury, and carried down to the tip of the organ, and into the nostril, and subsequently extended from the lower border of the nostril, through the median line of the upper lip, which is completely divided (see Fig. 96). The flap is now dissected up, until the bony opening of the anterior nares and the anterior surface of the superior maxilla is completely exposed. The next step consists in separating the periosteum from that portion of the hard palate which the operator designs to remove. The second bicuspid tooth is now drawn, and with a stout pair of cutting forceps the alveolus at this point is cut through into the cavity of the antrum, when the forceps are still further inserted, one blade in

the antrum and the other in the oral cavity. The section is extended back until it reaches the median line at the posterior border of the hard palate (see Fig. 97). The external wall of the antrum is now divided in a line extending up to a point immediately below the infra-orbital foramen, when from this point, by means of forceps, a section is made extending backward in a horizontal direction to the pterygo-maxillary junction (see Fig. 98), after which the mass is seized with a strong forceps and wrenched from its position. In this manner access is gained to the posterior portion of the nasal cavity, and the naso-pharynx. The operation is comparatively simple and involves

FIG. 97.—Line of Bony Section in Péan's Operation.

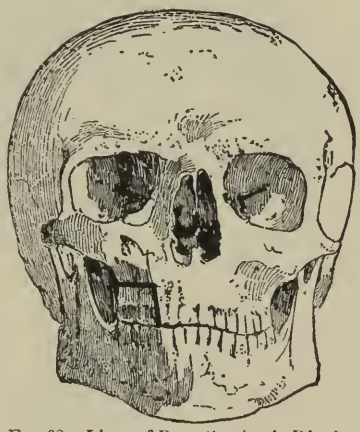

FIG. 98.—Lines of Bony Section in Péan's Operation.

no serious complications, and, while affording a somewhat restricted opening, possesses the advantage of leaving in position the incisor teeth, the patient being deprived simply of the last three molars and one bicuspid.

BÉRARD'S OPERATION.

This operation is devised to obtain access to the cavities of the nose and naso-pharynx, by means of a permanent resection of the central portion of the superior maxilla, without disturbing the alveolar process, and is made as follows:

The anterior face of the bone is exposed by making an incision through the integument either along the median line of the nose, or the side of the nose, extending down through the upper lip (see Fig. 99). After the bony orifice of the anterior nares, together with the anterior wall of the superior maxilla, is exposed, a section is made of the nasal process, by means of a cutting forceps, one blade of which

is introduced into the anterior nares and the other into the orbit, the direction of the incision being obliquely outward. A second incision is made in a similar manner through the malar bone, at its junction with the superior maxillary bone, after which a section is made from the lower border of the bony orifice of the anterior nares, through the body of the bone, to the pterygo-maxillary junction (see Fig. 100). The detached fragment is then wrenched from position, thus removing the outer wall of the nasal cavity together with the

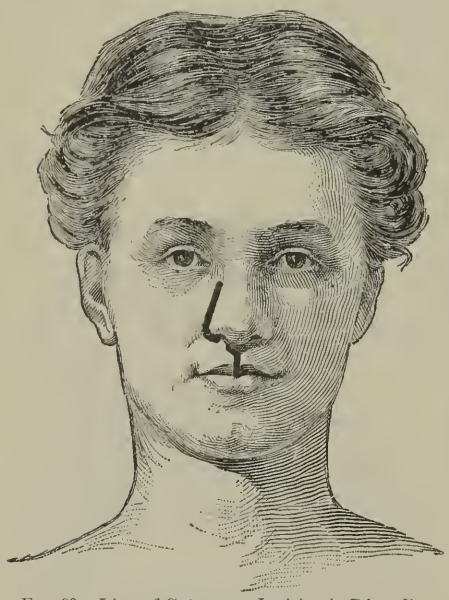

Fig. 99.—Line of Cutaneous Incision in Bérard's Operation.

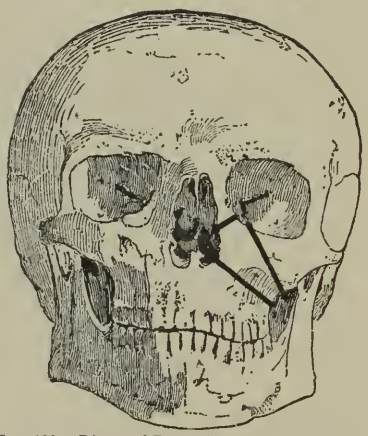

Fig. 100.—Lines of Bony Section in Bérard's Operation.

anterior wall of the antrum, giving access to the nose through an opening which really is commensurate with the size of the antral cavity.

Huguier's Operation.

This operation differs in no marked degree from that of Bérard except that he removes a smaller fragment. The outer bony section, instead of being extended through the malar bone, is made through the body of the superior maxilla, almost entirely within the malo-maxillary junction (see Fig. 101).

Vallet's Operation.

This procedure consists of a permanent resection of a still smaller portion of the body of the superior maxillary bone, and is done as

follows: An incision, commencing just below the internal angle of the eye, is carried along the nasal furrow, and around the root of the nose, to the nostril, and then extended from the inner border of the nostril down the median line, completely dividing the upper lip. The flap being dissected off, the bony opening of the anterior nares of that side is exposed, together with the anterior wall of the superior maxillary bone. A section of bone is now made with a chisel commencing at the lower border of the bony opening of the nares, and

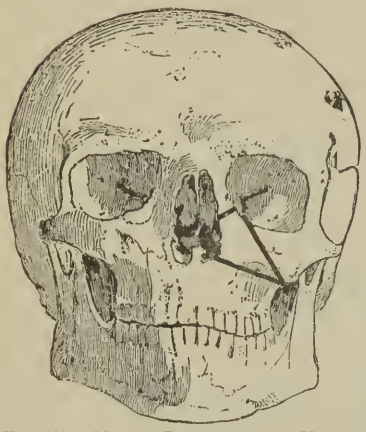

FIG. 101.—Lines of Bony Section in Huguier's Operation.

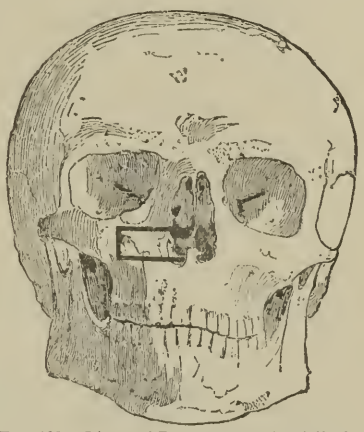

FIG. 102.—Lines of Bony Section in Vallet's Operation.

extending outward and parallel with the alveolus as far as the first bicuspid. A similar section is made, commencing in the nares and parallel with this, extending outward just below the infra-orbital foramen. The outer ends of these two incisions are united by a third section (see Fig. 102), when, by means of stout scissors or forceps, the outer wall of the nasal cavity is cut, first below and then above, in the lines of the original parallel sections through the anterior wall of the superior maxilla. The fragment is not wrenched from its position. As will be seen, Vallet in this operation simply removes the anterior and inner wall of the maxillary sinus, which is thus opened into the nasal cavity, giving a free access to this passage, although a somewhat limited one to the pharyngeal vault.

SECTION IV.

DISEASES OF THE FAUCES.

DISEASES OF THE FAUCES.

CHAPTER XLIX.

THE ANATOMY OF THE FAUCES.

The term fauces is perhaps a somewhat unfortunate one, and yet we use it here in lieu of any better, as embracing that region in the back of the throat and oral cavity which contains the lower pharynx, or, as it should be termed, the oro-pharynx, the soft palate, the uvula, the tonsils, and the glosso-epiglottic fossæ. These various structures are so intimately associated in the performance of their various physiological functions that they really constitute an independent and separate portion of the air and food tract. We shall therefore reach a far more intelligent comprehension of these functions by grouping the parts together and designating the region which they constitute as the fauces.

This region we may describe as lying immediately behind the oral cavity, and constituting a somewhat quadrilateral-shaped space, which is bounded posteriorly by the oro-pharynx and anteriorly by the cavity of the mouth, while its roof is formed in front by the soft palate and uvula and behind by an imaginary plane which extends from the free border of the soft palate to the post-pharyngeal wall, thus dividing the oro-pharynx from the naso-pharynx. Its floor may be described as extending from the orifice of the œsophagus to the root of the tongue, including in this region the arytenoid cartilages and commissure, the orifice of the larynx, the crest of the epiglottis, and the lingual or hyoid fossæ.

The parts which call for special description are:

The Oro-Pharynx.—The oro-pharynx is usually described as constituting a region or space in the upper air and food tract.

For all proper clinical consideration it is quite sufficient, I think, simply to describe what is usually regarded as its posterior wall. This constitutes a quadrilateral area, extending from the prominence

of the axis to the orifice of the œsophagus, or, as Luschka prefers to describe it, from the base of the uvula to the posterior extremity of the great cornua of the hyoid bone. It is concave from side to side and slightly so from above downward. Its length in the average adult varies from $1\frac{3}{4}$ to $2\frac{1}{8}$ inches, while its width is from $1\frac{3}{8}$ to $1\frac{3}{4}$ inches. It is formed of three layers—the mucous membrane, the submucous fibrous layer, and the muscular structures.

The Mucous Membrane.—The mucous membrane is of the type ordinarily found in the food tract, in that it is covered with squamous epithelium, and is thin, somewhat attenuated, dense in structure, and closely adherent to the parts beneath. It is the usual practice to describe two varieties of glands as being found in this membrane, the ordinary acinous glands and the ductless or lymphoid follicles. Until we have further evidence as to the glandular character of these ductless follicles, I think we are hardly justified in designating them as true glandular structures.

The lymphoid follicles are scattered somewhat irregularly throughout the deep layers of the membrane, although they show a tendency to aggregate themselves on either side of the pharynx, in rows as it were, parallel with the posterior pillars of the fauces. They are also somewhat thicker in the upper portion of the pharynx, where they seem to form outlying portions of the large mass of lymphoid tissue which constitutes the pharyngeal tonsil.

The Fibrous Layer.—The fibrous layer separates the mucous membrane from the muscular tissues. It forms a thick aponeurotic structure where it is attached to the basilar process above, but gradually becomes thinner below and is lost as it approaches the œsophagus.

The Muscular Layer.—Immediately beneath the fibrous layer we come upon the constrictor muscles of the pharynx, the superior, middle, and inferior (see Fig. 103).

The superior constrictor muscle is quadrilateral in shape, and arises from the lower third of the margin of the internal pterygoid plate and its hamular process, from the contiguous portion of the palate bone, and the reflected tendon of the tensor palati, from the pterygo-maxillary ligament, from a portion of the alveolar process of the inferior maxilla, and by a few fibres from the side of the tongue. From these various points, the fibres curve backward, and are inserted into the median raphé, and also by means of a fibrinous aponeurosis, into the pharyngeal spine of the occipital bone.

The middle constrictor muscle overlaps partially the superior constrictor at its lower part. It arises from the whole length of the greater cornu of the hyoid bone, from the lesser cornu, and from the

stylo-hyoid ligament. The fibres of this muscle diverge from their origin, and are inserted into the posterior median raphé of the pharynx.

The inferior constrictor muscle arises from the side of the cricoid and thyroid cartilages, the fibres curving backward to be inserted into the median raphé of the pharynx. The lower fibres blend with the muscular tissues of the œsophagus, while the upper overlap those of

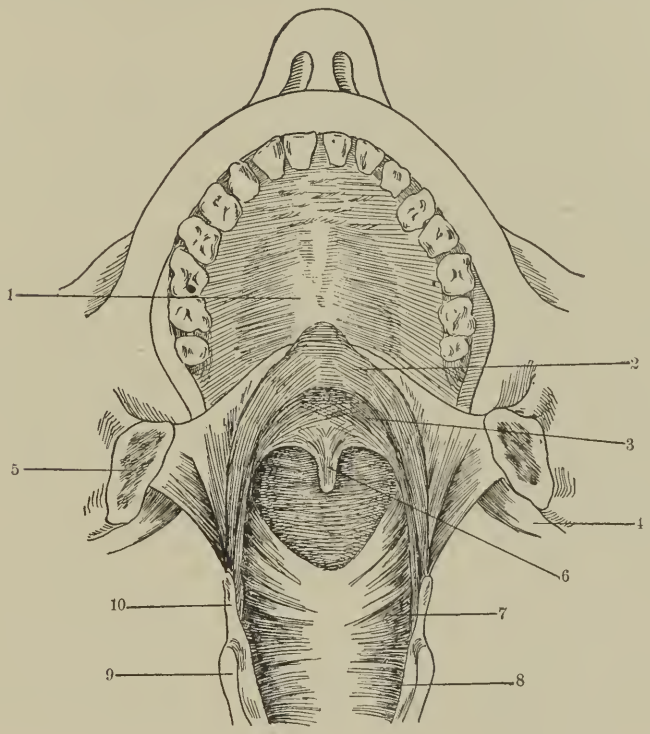

FIG. 103.—The Muscles of the Soft Palate and Pharynx, seen from the front. 1, Hard palate; 2, palato-pharyngeus; 3, levatores palati; 4, internal pterygoid; 5, inferior maxilla; 6, azygos uvulæ; 7, middle constrictor; 8, inferior constrictor; 9, thyroid cartilage; 10, superior cornu of the thyroid.

the middle constrictor. Immediately beneath the latter two of these muscles, and separating them from the body of the vertebra on either side of the median line, are found the longus colli and the rectus capitis anticus major muscles, while between the superior and middle constrictors courses the slender body of the stylo-pharyngeus muscle, which, arising from the inner side of the styloid process, passes downward and is partially inserted into the posterior portion of the thyroid cartilage and partially merged in the constrictor muscles.

The muscular movements of the pharynx proper are thus provided for by the three constrictor muscles, which practically constitute one muscle divided into three portions. These would seem to be arranged in such a way as to give the most vigorous constrictor action, together with a firm support of the pharyngeal wall, which is still further secured by the muscular layers overlapping each other between each of their divisions. Thus, the lower border of the superior constrictor is overlapped by the superior border of the middle, and, in the same way, the upper border of the inferior muscle notably overlaps the lower border of the middle.

Nerves.—The nerve supply of the pharynx is derived mainly from the glosso-pharyngeal nerve and the pharyngeal plexus. These supply the mucous membrane with general sensation and the constrictor muscles with motion, the lower constrictor receiving some additional innervation from the external laryngeal nerve.

The Plica Salpingo-Pharyngea.—Laterally the walls of the pharynx curve forward to the fold formed by the reflection of the mucous membrane over the palato-pharyngeus muscle, constituting the posterior palatine pillar. In the hollow of this lateral concavity there is found a slightly projecting fold of the mucous membrane, which extends from the posterior lip of the Eustachian orifice downward until it is lost in the parts below, thus forming in its upper portion the anterior border of the fossa of Rosenmüller. It is designated as the plica salpingo-pharyngea or salpingeal pharyngeal fold.

Properly speaking, this fold belongs to the lateral walls of the naso-pharynx, although in many instances it can be observed extending down into the oro-pharynx. It consists essentially of a fold of mucous membrane, although this is thrown into greater prominence by the rich distribution of lymphoid follicles which are found embedded in it, this latter feature giving it its clinical importance, in that when these follicles are in a state of chronic inflammation it constitutes one of the forms of pharyngitis lateralis.

Arteries.—The blood supply is derived from the ascending pharyngeal, which, having its origin in the external carotid artery, passes up through the deeper tissues of the neck, and coursing along on the belly of the stylo-pharyngeus, sends branches both to the constrictor muscles and to the mucous membrane of the pharynx.

In addition to this, a certain amount of arterial supply is derived from the terminal branches of the internal maxillary, viz., the vidian, the descending palatine, and the arteria pharyngea suprema; and from the facial, viz., the ascending palatine and tonsillar arteries; and also from certain terminal twigs of the thyroid arteries.

The ascending pharyngeal artery, although a vessel of some size,

is not ordinarily visible on direct inspection of the pharynx, and yet a number of cases have been reported in which the artery was of such abnormal size, either on one or both sides, as to render its pulsations visible on direct inspection.

Veins.—The veins form a dense network spread out in the fibrous layer, the blood being collected by venous channels which follow the general course of the arteries. Those on the lateral wall of the pharynx empty into the facial vein, while those from the upper part empty into the internal jugular or the inferior petrosal sinus.

Lymphatics.—The lymph vessels form a network which lies partially in the submucous tissue and partially in the deeper layers. With these last, some of the follicles which are seen on the posterior wall of the pharynx are in communication. This occurs largely at about the level of the third cervical vertebra, where the greater number divide into two sets, which lie on the lateral walls of the pharynx, at a varying distance from the median line. Here they are in communication with the small lymphatic glands which are covered by the rectus capitis anticus major muscle. On the right side the lymphatic channels empty into the right ductus lymphaticus, while on the left side they empty into the receptaculum chyli.

The Soft Palate, Uvula, and Pillars of the Fauces.—Attached to the posterior wall of the hard palate, and projecting backward and downward, is a soft, flexible fold, composed of aponeurosis, muscular tissue, and mucous membrane, which is designated as the velum pendulum palati or soft palate. To the centre of this, posteriorly, is attached a projecting portion to which the name uvula is given, while laterally it is reflected to the side of the fauces in two folds, the anterior and posterior palatine arches, the whole constituting both anatomically and physiologically a single organ. The aponeurosis of the soft palate consists simply of a fibrous layer, which is attached to the hard palate anteriorly, and is gradually lost as it approaches the posterior border. The mucous membrane of the lower or oral surface of the palate is covered with squamous epithelium, as forming part of the food tract, while that of its upper surface is endowed with columnar ciliated epithelium, in that it belongs essentially to the air passages.

It is endowed with both muciparous glands and lymphoid follicles. The only peculiarity about the muciparous glands lies in the fact that they are embedded deeply within the tissues, extending even down to the muscular tissue, whose fibres interlace about them in such a way that muscular contraction has a tendency to increase the secretion of mucus or to press it out, as it were, upon the surface of the membrane.

The glands are distributed somewhat evenly throughout the membrane, with the exception that at the free border of the palate and in the uvula no gland structures are found. Furthermore, at the extremity of the uvula the mucous membrane is much thicker than at other portions of the velum, and of a less dense structure, an anatomical condition which tends to explain the facility and frequency with which an œdematous swelling occurs at this point.

The muscles which are of importance as giving movement to the soft palate and uvula are the azygos uvulæ, tensor palati, levator palati, palato-glossus, and palato-pharyngeus (see Fig. 103), somewhat in the reverse order of their importance.

The azygos uvulæ is not a single muscle, but in most cases consists of two distinct bundles of muscular fibres, which, arising from the posterior nasal spine of the hard palate and from the contiguous aponeurosis of the soft, pass downward and are inserted into the tip of the uvula. Rüdinger has demonstrated a muscle which he calls the azygos uvulæ inferior, which runs from the mucous membrane of the tip of the uvula, upward, to be inserted into the anterior surface of the soft palate.

The tensor palati, or better perhaps, as indicating its origin, the spheno-salpingo-staphylinus muscle, arises on either side from the outer third of the membranous wall of the Eustachian tube, and from the long groove at the base of the internal plate of the pterygoid process. From these origins, the fibres ascend vertically on the outer side of the pterygoid process, and are converged into a round tendon, which winds around the hamular process from without inward, being separated from this process by a small bursa. After passing along the hamular process, the round tendon is spread out into a broad, flat aponeurosis, a portion of which is inserted into the posterior border of the hard palate, the other portion blending with the aponeurosis of the corresponding muscle of the opposite side.

The levator palati or petro-salpingo-staphylinus arises from the flat surface near the apex of the petrous portion of the temporal bone, and from the cartilaginous and membranous wall of the Eustachian tube. Its fibres spread out, the upper being inserted into the aponeurosis of the muscle just described, and the lower into the free border of the palate near the base of the uvula, the fibres from each side interlacing with those of the other. Laterally some of the fibres blend with fibres of the palato-pharyngeus muscle.

The palato-glossus arises from each side of the base of the tongue, as a thin flat bundle of muscular fibres, some of them coming from the stylo-glossus muscle. From these origins the fibres ascend vertically to the anterior surface of the soft palate, where they are

inserted, blending with muscular fibres of the opposite side. This muscle is covered with mucous membrane, and projects into the fauces, forming at the end a sharp, thin fold leading in front of the tonsil, forming the anterior pillar of the soft palate.

The palato-pharyngeus muscle forms with its fellow a girdle, as it were, of muscular fibres which arises principally from the anterior surface of the soft palate, immediately beneath the mucous membrane, blending with the anterior fibres of the tensor palati. A few fibres also arise from the posterior surface of this muscle. From this origin the fibres run downward and backward to the posterior and inner side of the thyroid cartilage. Some of the posterior fibres run as far back as the posterior wall of the larynx, blending with fibres of the salpingo-pharyngeus muscle when this muscle is present. This muscle as it passes down behind the tonsil forms, with the mucous membrane which covers it, another sharp fold which projects into the fauces, constituting a posterior pillar of the palate, or, as it is sometimes designated, the posterior pillar of the fauces. At the side of the soft palate, and immediately in front of the anterior palatine pillar, a slight sulcus is formed between the projecting pillar and the fold of the mucous membrane which is reflected from the soft palate to the alveolar process of the lower jaw. Allen gives to this sulcus the name of the precoronoid space, on account of its relation to the coronoid process of the inferior maxilla.

Arteries.—The arterial supply to the palate is derived from the internal maxillary artery, through the descending palatine, and from the external maxillary or facial, through the ascending palatine. This last forms an intimate anastomosis with the tonsillar artery, also a branch of the facial. The lingual and ascending pharyngeal arteries also contribute slightly to the arterial supply.

The Veins.—The veins on the posterior surface are continuous with the veins of the nasal mucous membrane. On the anterior surface they are more numerous, and empty into the pterygoid plexus and into the pharyngeal veins.

Lymphatics.—The lymphatics of the soft palate are very numerous and form an anterior and posterior network, which are continuous with those of the base of the tongue on the one hand and of the nasal mucous membrane on the other. This lymph plexus is connected with the larger lymphatic glands, which lie in the neighborhood of the bifurcation of the common carotid artery, and of the greater cornu of the hyoid bone.

Motor Nerves.—The motor nerves are derived from the third branch of the fifth, which supplies the tensor palati, a branch of the vagus, which through the pharyngeal plexus supplies the azygos

uvulæ, the levator palati, and the palato-pharyngeus. The glosso-pharyngeus supplies the palato-glossus muscle. The facial nerve also probably sends motor branches to this region.

Sensory Nerves.—The sensitive nerves are derived principally from the second division of the fifth, with some branches from the vagus and glosso-pharyngeal nerves.

Anomalies.—In the process of development of the palate, various anomalies have been met with, which, while of more interest perhaps from an anatomical point of view, yet possess a certain pathological importance. In most of these there is no evidence whatever of any attempt on the part of nature to repair the difficulty, and yet occasionally an effort in this direction is observed. Bifid uvula is perhaps the most frequent anomaly met with in the soft palate, and yet in a very large number of cases that have come under my own inspection I have never yet seen a case which required operative interference on account of any symptoms directly dependent upon the condition. Trélat regards this condition as one closely associated with cleft palate, considering both as to an extent hereditary.

The most common form of this anomaly is that in which a slight furrow is observed along the median line of the uvula, the organ terminating in two tooth-like projections.

Cases are recorded in which the palato-glossus muscle was endowed with a separate investment of mucous membrane, in such a way as to produce an elongated fenestra, as it were, through the anterior pillar of the fauces; the condition being observed on one or both sides of the fauces. The abnormal opening in the faucial pillar may extend only through the mucous membrane of its anterior face, thus forming a blind pouch whose depth is limited by the thickness of the pillar.

In one case a narrow slit-like orifice was seen on the free margin of the posterior pillar of the fauces on the right side immediately behind the tonsil. The opening was not more than one-eighth of an inch in length, its edges being in contact. From this point, a diverticulum extended to the manubrium sterni, occupying the space between the external and internal carotid arteries. In another case, there seemed to be a broadening or expansion of the insertion of the anterior pillar of each side into the sides and dorsum of the tongue, the result of which was that the movement of the tongue was somewhat hampered, its protrusion being attended with a drawing forward of the palate into the mouth. A somewhat similar condition was observed in a child in which the tongue in its middle third was adherent to the alveolus of each side, the effect of the condition being to render the child unable to take nourishment until the adhesions were broken up.

The Tonsils.—This is the name which is given to a mass of lymphoid tissue found between the two pillars of the fauces, and which is ordinarily described as an almond-shaped organ, possessing a somewhat definite form and outline, while again it is referred to simply as a mass of glands situated in this region. Now, as a matter of fact, it is exceedingly difficult to describe with any degree of definiteness a typical tonsil, in that, owing to the peculiarity of its structure and the character of the tissue which enters into its composition, it undergoes certain progressive changes from birth to old age, which are inherent in and common to all lymphoid structures. Moreover, these tissues are exceedingly liable to take on diseased action in early life, as the result of exposure, or perhaps from some systemic dyscrasia, in consequence of which it is not an easy matter always to determine whether the mass of tissue which we call the tonsil, in any individual case, is the result of regular and progressive development, or of diseased action.

Its antero-posterior boundaries are always limited by the two pillars of the fauces, while, as regards its vertical extension, an exceeding great difference is noted in individuals. This is more particularly referable to its lower border, for, whereas its upper border is limited by the convergence of the two faucial pillars in the soft palate, its lower boundary is to an extent unlimited, for we not unfrequently see it extending down beyond the base of the tongue, its normal boundary, and even sending prolongations as far as the lateral walls of the laryngeal cavity.

As regards the anatomical relations of this organ, I know of no better description than that of Delavan, as follows: "The relations of the tonsil to the internal carotid artery are not so intimate as commonly is supposed, for between the lateral wall of the pharynx, the internal pterygoid, and the upper cervical vertebra there is a space filled with cellular tissue, the pharyngo-maxillary interspace, in the posterior part of which are located the large vessels and nerves, and which lies almost directly backward from the pharyngo-palatine arch. The tonsil corresponds to the anterior part of this interspace, so that both carotids are behind it, the internal carotid one and five-tenths centimetres, the external carotid two centimetres distant from its lateral periphery."

Perhaps we can describe the ordinary type of tonsil, in the majority of individuals in adult life, as consisting of a small, elongated, almond-shaped mass of lymphoid tissue, which presents on its outer surface from five to ten orifices leading down into blind pouches, or pockets, the whole forming an organ which lies deeply embedded in the sulcus between the two palatine arches, and which, in the ordi-

nary inspection of the fauces when at rest, does not project beyond the faucial pillars, and in fact is scarcely visible on gross inspection. The faucial tonsil in a healthy throat constitutes an organ of but trivial significance, either from an anatomical, physiological, or clinical point of view, and possesses an interest to us only when it attains sufficient size to encroach notably upon the fauces, and to give rise to prominent morbid symptoms. Except very early in fœtal life, or in infancy, the mass of the tonsil is made up of hypoblastic tissue. This consists of cells, some round, others elongated or stellate, which, as seen by the microscope, constitute simply lymphatic tissue. The development of the tonsil practically consists in the grouping together of these lymphatic cells into masses, constituting blind follicles or lymph nodules, these nodules being separated from each other by layers of connective tissue, the origin of this connective tissue being in the hypoblastic layer, the lymphatic cells of which have undergone transformation into connective-tissue cells. The whole mass of the tonsil, then, is made up of lymph tissue of this character, surrounding a somewhat varying number (from eight to twelve) of deep, pouch-like cavities or pockets, the crypts of the tonsil, formed by the development of the original invaginations already described as commencing in fœtal life. The whole mass is covered by mucous membrane, which not only covers the face of the tonsil presenting in the fauces, but also extends down into the crypts of the organ. The mucous membrane is of the ordinary type, covered with epithelium, which is squamous on the surface and becomes cylindrical in its deeper layers. We thus find the tonsil made up of a mass of lymphoid tissue in which the covering mucous membrane is arranged in such a way that these invaginations or crypts assume somewhat the form of a muciparous or secreting gland, with this difference, however, that the epithelium which lines the tonsillar crypts is not of the same character as that which we find lining ordinary muciparous glands; hence, the secreting capacity of these crypts is exceedingly limited, probably pouring forth nothing more than sufficient mucus to keep the surface moistened and lubricated.

Arteries.—The arterial supply is derived from the dorsalis linguæ, the ascending palatine and tonsillar, the ascending pharyngeal and the descending palatine arteries. The most important of these, probably, is the tonsillar, which enters the base of the tonsil at about the junction of its middle and lower thirds. This vessel possesses no especial importance in the healthy tonsil. When the organ, however, is largely hypertrophied, the artery assumes a considerable size, and may give rise to very troublesome hemorrhage after tonsillotomy. It should be observed, however, that it is only in adult life

or soon after puberty that we find this artery sufficiently developed to be the source of troublesome hemorrhage, which would seem to indicate perhaps that the blood-vessels of an enlarged tonsil in adult life are not only more extensive, but more thoroughly developed.

Veins.—The veins terminate in the tonsillar plexus on the outer side of the tonsil.

Nerves.—The nerves are derived from the fifth and from the glosso-pharyngeal.

Lymphatics.—The gross distribution of the lymphatics has been sufficiently dilated upon in the description of the lymphatics of the pharynx. With reference to the termination of these vessels in the tonsil, Schmidt believes that they open by their deep extremity into the reticulum of the blind follicles. Retterer, however, has shown that the capillary network really occupies the entire follicular mass, forming a system of closed canals, which open neither by stomata nor by their extremities.

Anomalies.—Congenital absence of both tonsils has been reported. In another instance, they consisted of pedunculated growths attached to the posterior pillar of the fauces, and hanging down behind the base of the tongue so far that it could not be seen when the parts were at rest, although, when brought into view on contraction of the posterior pillars, it almost completely filled the faucial opening.

CHAPTER L.

THE PHYSIOLOGY OF THE FAUCES.

The functions of the various anatomical parts which we have already described as entering into the formation of the fauces are co-ordinate, and are therefore necessarily grouped together for consideration, the function of the tonsils being reserved for special discussion. They are comprehended in the two physiological processes of deglutition and phonation, or more properly, articulation.

Deglutition.—After the bolus of food has been properly masticated in the oral cavity, it is forced back to the faucial opening by the elevation of the tongue against the roof of the mouth, by the action of purely voluntary muscles. As soon as it reaches the base of the tongue, muscles whose action is largely involuntary force it by somewhat vermicular progressive contractions into the stomach. After the bolus passes the palato-glossus muscles which form the anterior faucial pillars, these muscles contract in such a way as to prevent its return to the oral cavity. Simultaneously with this movement, the food is prevented from making its way into the naso-pharynx by the contraction of the palato-pharyngeus muscles, whose edges are brought almost into parallelism from above downward, closing the opening between the lower and upper pharynx, although it is probable that a slight opening is left at the apex of the arch, which is closed by the body of the uvula. The function of the uvula is probably not of great importance in this connection, for, as we know, when this organ is completely amputated, the individual suffers no apparent inconvenience in the act of deglutition, which may be in part accounted for by the fact that the azygos uvulæ muscle extends above the edge of the soft palate, forming a ridge on its upper surface.

The contraction of the muscles which comprise the faucial pillars, both posteriorly and anteriorly, seems to be an involuntary or reflex movement excited by the presence of the bolus of food.

At the same time that the faucial pillars contract, the larynx is drawn up beneath the base of the tongue, by the action of that group of muscles which is attached to the hyoid bone, namely, the anterior

belly of the digastric, the mylo-hyoid, the genio-hyoid, the stylo-hyoid, and some fibres of the genio-hyo-glossus. This movement, which is also purely an involuntary one, accomplishes two purposes. By the raising of the larynx beneath the base of the tongue, the epiglottis falls over the laryngeal opening, thus preventing the entrance of food into the air passages. It has usually been considered that this was the main function of the epiglottis, but later investigation has shown that the importance of the epiglottis in this connection has been overestimated, in that when this cartilage has been entirely destroyed by disease the particles of food are still excluded from the larynx, in deglutition, by the contraction of the arytenoepiglottidean or laryngeal constrictor muscles. With the raising of the larynx, the pharyngeal wall is also elevated, this movement being aided by the contraction of the palato-pharyngeus muscle. This movement brings the constrictor muscles of the pharynx into such position that they grasp with ease the bolus of food, which, when seized, is carried down with the dropping, as it were, of the pharynx, when the bolus is passed into the œsophagus and to the stomach.

The Function of the Tonsils.—The tonsils have, since the early days of medicine, afforded field for study, which, on account of the frequency with which they become the seat of morbid changes, has always been interesting, and yet, as the result of a total ignorance as to their true anatomical structure, have furnished us a number of most curious theories as to their special function in the economy. They were variously described as composed of ordinary glandular structure, as a collection of small pouches in the pharyngeal wall, and as follicles destined to secrete a lubricating fluid to moisten the bolus of food, and to facilitate its passage through the œsophagus. We now know that the tonsils are made up of an aggregation of lymphatic nodules, and that their function is probably similar to that of Peyer's patches in the intestinal canal. But what the function of the lymphatic glands really is remains still an unsolved problem.

Even with our more definite knowledge of the microscopic structure of the tonsil we scarcely attain to any more specific information as to its principal function. Indeed, we are launched upon a still wider sea of speculation and thought, and yet, while probably for some time to come the question as to the cytogenetic function of the tonsil must still remain an unsolved problem, I think its absorbent function must be accepted, for, while this is a function of no great importance in the general economy as a physiological process, the fact of its existence is rather strikingly shown as a pathological process, based on purely clinical grounds. It has been supposed by some that the tonsil supplies a favoring surface through which the

materies morbi of scarlet fever and diphtheria makes its entrance into the circulation; by others that the faucial tonsils protect against pathogenic germs entering the mouth with the ingesta, and that the tonsil tissue possesses the property of converting starch into sugar.

I have arrived at the conclusion that the tonsil is an absorbent and not a secreting organ; and yet I think this statement must not be accepted as absolute, in that the peculiar form which the lymphatic tissue assumes in its development, viz., folds or ridges, as it were, gives rise to the mechanical formation of deep fissures and pockets, the so-called crypts in the tonsil, which constitute what are practically large tubular glands, although their secreting power is exceedingly limited. That they possess any function as such is probably not a safe statement; that they possess a secreting power, however, all must accept.

CHAPTER LI.

ACUTE PHARYNGITIS.

The term acute pharyngitis should be used to describe an acute inflammation of a catarrhal nature, involving the mucous membrane of the lower pharynx only. As a matter of clinical observation, however, I am disposed to think that an acute inflammation confining itself to this region seldom if ever occurs. We do, however, meet with an acute inflammation involving the pharynx in connection with the soft palate, uvula, and the pillars of the fauces—in fact, constituting an acute faucitis, which occurs purely as an idiopathic disease, and ordinarily as the result of some simple exposure. I regard an inflammatory process of a catarrhal nature as a somewhat rare event in the pharyngeal mucous membrane, notwithstanding the fact that most of our standard text-books on diseases of the throat seem to affirm the opposite opinion. I should mention, however, that these statements refer only to an acute idiopathic pharyngitis, and not to manifestations of the exanthemata, such as measles, scarlet fever, small-pox, typhoid and typhus fevers, as well as syphilis, which may be considered one of the exanthemata.

Etiology.—The attack undoubtedly may be caused by an ordinary exposure to cold, such as sitting in a draught or wetting the feet, or other similar indiscretions, and yet I think the mucous membrane here obeys the same rule as that which we have already enunciated in a previous chapter in regard to the mucous membrane lining the nasal cavity, and that is, that, so far as the upper air passages are concerned, an acute inflammation, in probably the very large majority of cases, is merely a lighting up of a chronic inflammation. Hence, in most instances, an acute pharyngitis results from a cold or some exposure, in which the local manifestation of the cold, fixing itself upon parts already weakened by the morbid process, attacks the mucous membrane of the fauces. Now, we have already made clear the fact that the pharynx properly belongs to the food and not to the air tract. Hence a morbid process in this region does not occur always in connection with disease of the air passages, but rather with disease of the food passages. An acute pharyngitis,

therefore, is usually met with as an exacerbation of a chronic pharyngitis, which is dependent upon a chronic gastritis or some other disturbance of the digestive tract, such as torpid liver, constipation of the bowels, etc. The faucial region is also the seat of an acute inflammatory activity in connction with a similar process in the air passages above. Most frequently, perhaps, it is met with as a complication of or as the result of an acute naso-pharyngitis, although with almost equal frequency it occurs in the course of an acute rhinitis. In these cases, however, the faucial symptoms are not usually so well marked as when the disease occurs idiopathically, partly because the acute inflammatory process above gives rise to so much discomfort that the pharyngeal disorder is overlooked.

I do not agree with the view that inflammation of the fauces is most common in young people. As we have already found in a previous chapter, it is the glandular and lymphatic structures in young people which are most liable to be the seat of morbid action, while in adults it is the connective-tissue structures, among which we may class the mucous membrane proper as one most liable to be involved in an inflammatory process. Hence, in early life a pharyngitis takes on a follicular form, while in adult life a purely catarrhal pharyngitis is the rule. Moreover, this affection occurs most frequently in connection with a disordered stomach, and chronic dyspepsia is essentially a disease of adult life. As regards syphilis and scrofula their manifestations will be considered under a different category.

The close connection between acute pharyngitis and acute inflammatory processes in the naso-pharynx or the nasal cavities proper, does not seem to be sufficiently recognized. When an acute pharyngitis occurs in connection with a cold in the head, it is not due to an extension of the disease from above, but rather to an obstruction of nasal respiration. If, however, it occurs in connection with an acute naso-pharyngitis, this must be regarded as the result of an extension of the morbid process, although undoubtedly the engorgement of the lymphatic tissues above interfering with the return circulation of the blood-vessels from the parts below, necessarily leads to an acute engorgement of the lower area. It has been suggested that the use of alcohol, tobacco, highly seasoned foods, and hot drinks may excite an acute pharyngitis, through their local irritant action during deglutition. The faucial mucous membrane is covered with dense pavement epithelium, and is so thoroughly inured to the impact of substances of various kinds in the act of deglutition that I doubt if it is in any degree susceptible to irritants in this process. These articles may act on the stomach and liver, but not primarily on the pharynx. Hot drinks are usually taken without injury to the phar-

ynx, so far as their local action is concerned; although at the boiling point they may excite what is usually termed a traumatic pharyngitis, a subject which needs no special discussion. Cohen states that an acute pharyngitis may result from an extension of stomatitis. I have never observed such a tendency, and I think it must be exceedingly limited, unless perhaps in the case of mercurial stomatitis, wherein we occasionally find the mucous membrane of the soft palate and pharynx notably softened and relaxed, although scarcely constituting a typical acute pharyngitis. Belladonna, as is well known, produces a hyperæmic condition of the blood-vessels of the soft palate and pharynx, and yet in this case the membrane has usually a dry and glassy appearance, while the hyperæmia is largely venous in character, giving it a darker tint than is observable in acute inflammation. Iodide of potassium, on the other hand, produces a condition of the pharynx which cannot easily be discriminated from an acute idiopathic inflammatory process.

Pathology.—The pathology of the disease is the same as that of an acute inflammation involving the mucous membrane of any portion of the upper air tract, bearing in mind, however, that in the pharynx the parts are lined with squamous epithelium, and are very sparsely endowed with gland structures; hence the prominent changes consist in a notable hyperæmia and consequent thickening of the membrane involved, causing in the first stage of the attack an arrest of all secretion, viz., the dry stage. This is followed by a moderate serous exosmosis, with perhaps some increase of mucous secretions, although this is at all times scanty.

Symptomatology.—The attack is ushered in with a feeling of general malaise or mild chilly sensations, although the disease is never of so grave a character as to give rise to a well-developed chill. Indeed, the general disturbances due to the pharyngitis itself are usually of a somewhat trivial character, although if the disease complicates an acute rhinitis, or more especially an acute naso-pharyngitis, we may have an attack accompanied by constitutional disturbances of a somewhat well-marked character, such as decidedly chilly sensations, considerable prostration, and a temperature running up to 101° or 102° F., or even more. Accompanying the febrile movement, there may be pain in the bones, loss of appetite, and other evidences of systemic depression. In connection with this the patient experiences a sensation of dryness and discomfort about the fauces, with what is usually described as a scratchy feeling in the throat. After twelve to twenty-four hours, the parts become moistened with serous or sero-mucous secretions, which are quite limited in extent, unless in those cases in which the nose or naso-pharynx is involved,

when the discharge becomes considerable in amount. In general, we may state that the subjective symptoms of an acute idiopathic pharyngitis, as such, are not prominent. Cough is rarely if ever present, unless the larynx is also implicated in the idiopathic process. This is exceedingly liable to occur on the second or third day, the membrane of the larynx becoming the seat of a localized hyperæmia rather than of an inflammatory process, giving rise to a mild impairment of the voice, of which hoarseness is the prominent feature. The trachea may also become involved, in which case there is more or less secretion from these parts, which is expelled by the act of coughing. While there is usually no pain in deglutition, the pharyngeal mucous membrane becomes somewhat sensitive to the passage of either coarse particles of food or fluids above a moderate temperature. Cold, on the other hand, is rather grateful.

Diagnosis.—An examination of the parts should be made with care, the morbid process rendering this region excedingly sensitive. The whole mucous membrane, including the pharynx, the pillars of the fauces, and the soft palate and uvula, will be found to be the seat of a diffuse hyperæmia, which gives the membrane the characteristic bright reddish tinge of an active acute inflammation. This is the appearance seen in what we regard as an ordinary idiopathic pharyngitis, the result of a simple exposure to cold. The membrane is reddened and slightly swollen in appearance, athough this is more in the appearance than in the actual condition, because, as we know, the pharyngeal mucous membrane is a hard, dense structure, with a somewhat limited blood supply, the hyperæmia being largely of a capillary character. In the soft palate and uvula, however, where we find tissues more highly vascular and of a less dense consistency, the swelling is more marked. Especially is this true of the uvula, which is apt to show considerable swelling, which takes on an œdematous form.

If the attack is purely of an idiopathic nature, and not dependent upon or accompanied by an inflammatory process in the naso-pharynx or in the nasal cavities, the secretion from the parts is exceedingly limited. The tonsils also are somewhat swollen, projecting from the bed between the pillars of the fauces, and present the same hyperæmic condition as the parts above described, the extent of the swelling being dependent upon the amount of previously existing hypertrophy.

If the disease is secondary to an acute rhinitis or an acute naso-pharyngitis the pharynx proper is the seat of inflammatory changes already described, and is covered with a more or less profuse secretion of semi-opaque mucus or muco-pus, which diffuses itself over the whole region, or may collect in the central channel. The source of

this secretion, however, is in no case to be traced to the lining membrane of the lower pharynx, but is always poured out by the secreting structures of the naso-pharynx or the nasal cavity.

Prognosis.—A simple idiopathic case of acute pharyngitis usually runs its course in from five to seven days and involves no danger to life, or any serious impairment of the general health.

This statement should be made, however, with a certain amount of reservation, especially in young children, for I think there can be no question that a mucous membrane in a state of acute inflammation furnishes a favorable nidus for the development of graver diseases, such as croup and diphtheria.

Œdema of the glottis has occurred in the course of acute pharyngitis, but is probably due to some other morbid condition such as disease of the liver or kidneys.

Where paralysis of the palate occurs as a sequela, it should, as a rule, be accepted as evidence that the inflammatory process has been probably of diphtheritic origin.

Treatment.—If the affection is dependent upon a morbid process in the nose or naso-pharnyx, no treatment is of any avail, other than that directed to the mucous membrane of the air passages above. When, however, the disease consists of an acute inflammation only of the parts visible by oral inspection, much probably can be done in the way of applications made directly to the parts. The simplest method of making applications is by means of a gargle.

Chlorate of potash is perhaps as good a remedy as any in these cases, from five to ten grains to the ounce, the throat being gargled five or six times a day according to the discomfort of the patient.

Among other salts which may be used with good effect may be enumerated the following:

Sodii boratis, 10 gr. to the oz.; sodii bicarb., 8 gr. to the oz.; aluminis, 5 gr. to the oz.; and tannin, 5 gr. to the oz. These may be used singly or in combination.

A favorite method of applying astringents to the throat is by means of a lozenge. It is many years now since I have prescribed them, as the pharynx is in intimate sympathy with the stomach, and whether the stomach be notably deranged in an attack of acute pharyngitis or not, it is, I think, in all cases somewhat more sensitive than normal, and the nauseating sweets of which these lozenges are composed are ordinarily by no means agreeable to the patient. In those rare cases in which I have used medication in this form, I have preferred always that the drug should be incorporated in liquorice, which, even in its purity, is exceedingly agreeable to a patient suffer-

ing from this form of sore throat. For this purpose the following makes an excellent preparation:

℞ Ext. eucalypti, ... gr. xxx.
Sodii biboratis, ... gr. x.
Pulv. piment., ... gr. vij.
Ext. glycyrrhizæ, ... ʒ iiss.
M. ft. massa in trochisci No. xxx. div.

Cocaine, beyond any drug in the pharmacopœia, possesses the power of depleting the blood-vessels. Directly applied in solution to the pharynx, as by the atomizer, it gives rise to rather unpleasant symptoms and does no permanent good. Used in minute doses in the form of lozenges, however, it acts very agreeably.

If the throat is irritable with a disposition to cough, or the raw feeling is present of which the patients so often complain, some sedative may be used. Of these I think preference should always be given to some of the milder drugs, codeine for instance, rather than to opium or morphine.

If there is much secretion, which becomes thick and is not easily expectorated, we may use this combination.

℞ Ammonii muriat., ... gr. xxx.
Pulv. ipecac., ... gr. ij.
Pulv. capsici, ... gr. ss.
Ext. glycyrrhizæ, ... ʒ iiss.
M. ft. massa in trochisci No. xxx. div.

When the inflammation is not severe, even simpler remedies than any of the above may be administered in an ordinary sore throat. I have not infrequently prescribed the use of marsh-mallows, cream peppermint drops, glycerin tablets, or gum drops, horehound candy, pure rock candy, glycerin, lemon drops, and other simple confections of this sort, and I am confident that in many cases the comfort and welfare of the patient have been far better conserved than if I had administered a nauseating cough mixture.

Internal medication in this disease is not prominently indicated, and yet in all affections which are the result of an exposure to cold we must recognize a constitutional element, even if this is not evidenced by any marked elevation of temperature. Hence, in an ordinary catarrhal sore throat, the patient should be placed upon the use of from six to ten grains of quinine daily, given in divided doses, or, if this is not well tolerated, salicin may be given in from ten to fifteen grain doses three times daily. If the appetite is impaired, or there is any notable impairment of nutrition, these drugs may be combined with iron, as in the ordinary mixtures of iron, quinine, and strych-

nine. Aside from this, the indications for internal medication are limited to the use of some of the laxative mineral waters.

It is rarely necessary to confine a patient to the house with a cold; indeed I think, if the weather is not unfavorable, a brisk walk in the air is oftentimes beneficial. Nor, in taking outdoor exercise, is it necessary to make any elaborate and special preparation, in the way of extra clothing, muffling up the neck, etc. Such extra carefulness, I take it, rarely protects one from taking cold, but on the contrary enhances the danger of such an occurrence.

If the uvula is swollen and œdematous, it should be freely scarified, letting out both blood and serum. If possible, the punctures should be made on the lower and posterior portion of the organ, although this is not always feasible. In addition to these, the patient should be directed to use freely small pellets of ice, held in the mouth and allowed to rest against the swollen organ.

There are two internal remedies which seem to have a somewhat specific action on the circulation of the blood in the fauces. These are belladonna and aconite, and when the disease is obstinate their effect should always be tried. Of these, perhaps, the most active is aconite, which may be given preferably I think in the form of the alkaloid, aconitia, in doses of $\frac{1}{400}$ of a grain to an adult every two hours until its constitutional effect is experienced in the formication of the fauces, and the numbness and tingling of the extremities. In administering belladonna, we give the tincture with the idea that perhaps its local action in deglutition may add possibly to its beneficial effects, giving from three to five drops in a dessertspoonful of water every two hours until dryness of the fauces is produced.

It is an important duty of course, in these cases, to ascertain whether any complication exist in the nasal passages or in the nasopharynx, and to carry out such indications as may appear, for the control of these affections.

CHAPTER LII.

CHRONIC PHARYNGITIS.

By this term it is intended to designate a chronic inflammation of the mucous membrane lining the oro-pharynx, of a purely catarrhal nature, in which the morbid process involves the mucosa proper, and not the glandular or lymphoid structures. The inflammatory process confines itself almost exclusively to the pharyngeal mucous membrane; the soft palate, uvula, and pillars of the fauces not usually being involved in the morbid action, although, when the tonsils are moderately hypertrophied, we frequently find that they are in a state of chronic hyperæmia and turgescence.

Etiology.—Chronic pharyngitis is in no instance the result of repeated attacks of acute inflammation of this region, but on the contrary the chronic process sets in first, whereupon its clinical history is marked by repeated attacks of acute catarrhal sore throat. Moreover it is an exceedingly rare event to meet with a chronic pharyngitis as an uncomplicated idiopathic affection; indeed, I am of the opinion that the disease is an exceedingly rare one, if we insist that its recognition shall be based on distinct evidences of morbid action in the mucous membrane lining the oro-pharynx. In the majority of instances it is dependent upon some form of chronic gastritis. The most frequent form of gastric disturbance which gives rise to a pharyngitis is undoubtedly that due to chronic alcoholism.

We frequently meet with cases in which the use of tobacco gives rise to more or less distressing symptoms referable to the pharynx. In these cases I do not think that the tobacco directly excites the pharyngitis, but that its use aggravates the existing chronic inflammation, and the nicotine absorption produces an unpleasant gastric disturbance, which reacts secondarily on the pharynx. I think, then, we are warranted in the statement that the use of tobacco may aggravate an existing pharyngitis, but can produce it only secondarily, by first giving rise to a gastric catarrh. While I regard a chronic pharyngitis in the very large majority of instances as secondary to a gastric disorder, we occasionally meet with it, although perhaps rarely, in connection with a chronic naso-pharyngeal catarrh. In

this case it is due probably to the extension of the inflammatory process from the upper pharynx to the tissues below. This is aggravated to a certain extent by the fact that the naso-pharyngeal disorder is characterized by a profuse secretion of muco-pus, which is of a thick and tenacious character, and is expelled with considerable difficulty. While, therefore, a chronic pharyngitis may occasionally accompany a chronic naso-pharyngeal catarrh, it should be stated that this is rare, the morbid process in the naso-pharynx usually confining itself to this region, and, when diseased action in the passages below is caused by it, the morbid process usually passes over the oro-pharynx, to set up inflammatory changes in the larynx and the tissues beyond.

Another cause of the disease under consideration unquestionably may be found in some obstructive lesion of the nasal cavity proper. The most frequent of these, undoubtedly, is an hypertrophic rhinitis. This form of pharyngitis is usually of a somewhat mild character, and gives rise to no very notable symptoms referable to the faucial region.

Pathology.—The starting-point of this affection probably consists mainly of a general hyperæmia of the blood-vessels coursing through the membrane, followed by a moderate degree of hypernutrition, together with a slight excess of the normal amount of secretion. The hypernutrition, however, leads to no marked hypertrophy of the tissue, the morbid process expending itself largely in the engorgement of the blood-vessels, which becomes chronic. The membrane is thickened as the result of this hyperæmia, and also somewhat from a structural thickening of the mucosa proper, by the deposit of connective-tissue cells in the deeper layers. The blind follicles or lymph structures are not involved. The muciparous glands are but few in number, in the normal state, and these undergo no notable changes.

Symptomatology.—The symptoms to which a chronic pharyngitis gives rise are those due in the main to the disease on which the affection depends. If it occurs in connection with chronic gastritis, the pharynx is the seat of a constant sense of discomfort, with a feeling which the patient describes as one of rawness. There is no marked pain in swallowing, and yet highly seasoned foods or hot drinks pass the fauces with a certain amount of discomfort. If there is any marked excess of secretion, it is due to an accompanying naso-pharyngeal disorder, although there is a certain amount of secretion from the pharynx itself. The region is excessively irritable and intolerant of examination, this irritability being closely connected with the irritable stomach which is the frequent cause of the affection.

Diagnosis.—If the disease is dependent upon gastric disturbance,

the membrane lining the lower pharynx will be found to be in a state of chronic inflammation, characterized by marked venous congestion, the inflammatory process usually being limited by the posterior pillars of the fauces, and rarely extending in any degree to the soft palate or uvula, although in aggravated cases these regions are involved in the morbid process. The color of the pharynx in these cases is characteristic, presenting a deep red, highly congested, beefy, raw-looking membrane, which resembles a chronic catarrhal inflammation of no other region. The surface is soft and velvety, and yet it presents an angry look.

If the disease is dependent upon disease of the naso-pharynx, we find the same congested appearance of the membrane, although in a much less degree than that above described, while the soft palate and uvula are more liable to be involved in the morbid action, the membrane being swollen, congested, and notably relaxed. In this condition the mucous membrane is also freely coated with mucus, the source of which is in the glandular tissue of the naso-pharynx.

When the disease is dependent upon an hypertrophic rhinitis, the membrane assumes a somewhat dryer and glazed aspect, while at the same time it presents evidence of chronic inflammation, in the notable condition of hyperæmia, together with slight tumefaction.

The recognition of a pharyngitis dependent upon gastric disturbance is of importance mainly from a symptomatic point of view.

Treatment.—Although chronic catarrhal pharyngitis is usually a secondary affection, local treatment is of a certain amount of importance, although no topical applications can be of any avail until the active cause of the affection has been removed. If the disease is dependent upon a naso-pharyngeal catarrh or an obstructive lesion in the nose, the main indications for treatment are such as are directed to the cavities above. If the disease is dependent upon the use of tobacco and consequent gastric symptoms it must be interdicted.

It is not the province of this work to lay down any course of treatment for gastric catarrh. Accepting the pharyngitis as evidencing the existence of this, a course of treatment is imperative. The general rules which should govern this are familiar to all.

It is hardly necessary to state that the use of alcohol must be absolutely interdicted. Local applications should be made, at intervals of two or three days to the pharynx, of one of the following:

Argenti nitrat., ...	gr. 10 to 20 to the oz.
Zinci sulphatis, ...	gr. 10 to 20 to the oz.
Liq. ferri persulphatis, ...	♏ 10 to the oz.

CHAPTER LIII.

CHRONIC FOLLICULAR PHARYNGITIS.

This disease belongs essentially to the pharyngeal mucous membrane proper, without in any notable degree involving the tissues of the soft palate or uvula. It consists of a chronic inflammation of the lining membrane of the pharynx, in which the activity of the morbid process expends itself in the follicles, giving rise, mainly, to certain hypertrophic changes. This, in itself, would not excite any notable symptoms, were it not for the fact, which is confirmed by repeated clinical observation, that this follicular hypertrophy seems, in some rather obscure way, to involve the peripheral nerves, as the result of which the pharyngeal membrane becomes not only abnormally sensitive and hyperæsthetic, but also the seat of certain painful symptoms of a neuralgic character.

Etiology.—The disease undoubtedly commences in the earlier years of life. As we have already observed in young children, when the structures which compose the pharyngeal tonsil are in a state of hypertrophy, there will be seen scattered over the lower pharynx a number of small, rounded nodules, whose presence really constitutes a condition of chronic follicular inflammation. I am disposed to think that in early life these changes in the follicles in the lower pharynx are of such a character that they cause practically no symptoms whatever. When a lymph follicle has become the seat of hypertrophic changes, these probably remain to a certain extent permanent, the adenoid disease of the upper pharynx undergoing a retrograde process, by which a naso-pharyngeal catarrh is developed in adult life, while the follicular disease of the lower pharynx in child life results in a chronic follicular pharyngitis in adult life. In other words, a follicular pharyngitis in a child is a disease of no especial clinical significance; in adult life it may become the source of no little annoyance.

Underlying the development of all these forms of hypertrophy of the lymphatic glands, including pharyngeal and faucial tonsils and pharyngeal follicles, we must recognize the presence of that curious condition which we call the lymphatic diathesis, which, while not

constituting scrofula, is closely allied to it. Thus, we recognize the same general tendency in the hypertrophy of the pharyngeal follicles, and also in the enlargement of the lymphatic glands of the neck, and yet the clinical history of the two presents a markedly different picture. If this view be accepted, we can easily understand how the development of the disease is encouraged by improper nutrition, living in a damp, unhealthy atmosphere, and by other hygienic surroundings of a vicious character.

A follicular pharyngitis is more frequently observed in women than in men, and yet, probably, it exists with equal frequency in either sex. The fact that we see it more frequently in women is easily explained on the ground that these follicles make themselves felt more acutely, and give rise to more notable symptoms in individuals of a somewhat delicate constitution and nervous temperament.

I do not indorse the view that the follicular affection may develop from an ordinary catarrhal inflammation, as the two processes are practically distinct in their whole clinical history.

Any condition which impairs the general health, or interferes in any way with the normal functions, is liable to give rise to a sore throat when enlarged follicles exist, the general conditions causing the local disease to manifest more or less distressing symptoms, which are entirely in abeyance so long as the general health is good.

Many writers have asserted that the rheumatic and gouty diatheses, as well as syphilis, predispose to follicular pharyngitis. I think I have made clear my view, that enlargement of the lymphatic follicles is due, as a rule, to the existence of what we call the lymphatic temperament. And I repeat that a chronic follicular pharyngitis is a local disease of the oro-pharynx, in which the follicles have undergone hypertrophic changes in early life, as the result, in the majority of instances, of a peculiar habit, which we call the lymphatic diathesis; that these hypertrophic changes have remained while the general dyscrasia, probably, has disappeared with the growth and development of later years. When these follicles make their presence felt in the pharynx, it is purely as a local disease, and, while the symptoms may be aggravated by the coexistence of a morbid process in the nose or naso-pharynx, I do not believe that the follicular disease occurs as the result of the morbid process in the passages above.

Pathology.—Up to comparatively recent times, the part played by the lymphatic structures in the morbid process seems to have been entirely overlooked, and the view held that in follicular pharyngitis the morbid changes consisted in an hypertrophy of the mucipa-rous glands.

That the small hypertrophied masses in follicular pharyngitis

should have been considered as diseased muciparous glands is easily understood when we consider the close relation, both as to location and number, they bear to the normal secreting glands, though the essential morbid process consists of changes in the lymphatic tissues. The reason of this is very clearly demonstrated by Sailfield, who has shown us that the activity of the morbid process involves principally those lymphatic follicles which are grouped about the muciparous glands, and consists in an increase of the normal lymph elements, which are found distributed not only about the extended portion of the follicle, but about its outlet. The greatest activity of the process, however, is expended in the lymph tissue which is deposited about the follicular duct. Now, we should naturally suppose that the result of this would be to produce a stenosis of the duct. This, however, is not a feature of the disease, which, Sallfield explains, is due to a deposit of lymph tissue about the duct acting in such a way as to draw outward upon the duct walls, rather than to press inward, thus creating an abnormally open-mouthed follicle. In connection with this lymphatic hyperplasia, there is also a certain amount of hypertrophy of the elements which go to make up the normal muciparous gland. This is, however, of such slight extent, as compared with the morbid changes in the lymphatic tissue, that the disease process in this latter may be considered as constituting the whole of the morbid activity. In certain instances we may find this lymphatic hyperplasia extending, either locally or diffusely, in the deeper layers of the mucous membrane, thus constituting somewhat broadened plaques rising above the surface of the pharyngeal membrane, although, as a rule, the disease manifests itself in the small, rounded eminences usually seen on the wall of the pharynx. There is, also, a certain amount of hyperplasia involving the whole area of lymphatic distribution in the deep layers of the mucous membrane, giving rise to a thickening of the whole structure, although this is not apparent, usually, on gross inspection. I have already endeavored to make clear my understanding of the significance and history of lymphatic hyperplasias, viz., that the primary stage of the disease commences in child life, the morbid process being practically the same, whether it give rise to adenoid growths in the pharyngeal vault or to hypertrophy of the follicles of the lower pharynx. When this hyperplasia first occurs, the lymph follicles are large rounded masses, of soft and yielding consistence. As years go on, they seem to undergo certain changes, which, while not probably constituting either true atrophy or sclerosis, are characterized by a marked diminution in size, with increased density. In certain cases, undoubtedly, they disappear of themselves, the lymph tissue being reabsorbed. In other cases they

remain, constituting permanent morbid changes; when located in the vault of the pharynx, giving rise to a naso-pharyngeal catarrh; when located in the oro-pharynx, giving rise to a chronic follicular pharyngitis.

We occasionally find the follicular disease complicated by a chronic catarrhal inflammation of the pharyngeal mucous membrane. In this case, however, the latter process bears no special relation to the follicular hyperplasia, nor do I think it is in any way dependent upon it. As before intimated, we may find the diseased follicles showing themselves in minute, rounded eminences, scattered over the middle area of the oro-pharynx, or they may aggregate themselves on the sides of the pharynx, and immediately behind the posterior pillars of the fauces, constituting more or less prominent ridges in this region, this form of the affection being termed pharyngitis lateralis. In well-marked cases of pharyngitis lateralis, we occasionally find the posterior pillar of the fauces adherent to the elevated ridge on the pharyngeal wall.

Symptomatology.—As before stated, the presence of enlarged follicles in the pharynx, in child-life, is an exceedingly common occurrence, and yet at this period of life they seldom give rise to any symptoms. When, however, they persist till adult life, and have undergone retrograde changes, they give rise to symptoms far more marked than one would suppose could be caused by such an insignificant local lesion; but we must remember that no region of the body is endowed with a higher degree of both motor and sensory innervation than the throat, and so we find that any impairment of function or even slight morbid change in the throat is liable to be attended by symptoms which, although not distressing in character, are a source of exceeding great annoyance, being constant and harassing.

It is a somewhat prevalent idea that the prominent symptom of a disease process in the mucous membrane, in any portion of the air tract, is excessive secretion, and that any morbid process in the throat usually gives rise to what, in common parlance, is called a sore throat. I am disposed to say that hypersecretion is in no way a symptom of follicular pharyngitis. In those rare instances in which the muciparous glands which the hypertrophied lymphoid tissues inclose are preserved or enlarged, mucus undoubtedly may accumulate within the crypt, and undergo cheesy degeneration. This is purely an adventitious occurrence, and in no way complicates the disease. These little masses of cheesy matter make their appearance in the mouth of the follicle, and are forced out usually in the act of deglutition.

Notwithstanding assertions that pain is not a common symptom

of follicular pharyngitis, I am disposed to regard this as by far the most constant and most prominent symptom in this affection. The pain is usually of a dull, neuralgic character, referable to and seeming to diffuse itself over the back of the throat, and yet, when the fauces are tested we often find a certain amount of tenderness in the enlarged follicles which is more than hyperæsthesia, thus apparently establishing the fact that this sensitiveness is due to a localized nerve condition. This symptom constitutes a constant source of annoyance, and yet varies in a marked degree at different times. This is mainly the result of over-use of the muscles of the throat. Thus, for instance, while deglutition is not painful, the movement of the throat in deglutition seems to give rise afterward to an aggravation of the discomfort. In the same way, the excessive or prolonged use of the voice also seems to aggravate this symptom. It is by no means easy to explain why a follicular pharyngitis should give rise to this localized pain, unless we venture the theory that the terminal filaments of the sensitive nerves become involved to some extent in the hyperplastic process which invades the lymphatic tissue. When the lymph nodules have undergone the retrograde changes by which they become reduced to one-third or one-fourth their original size, it seems not altogether improbable that the terminal filaments become subjected to a certain amount of pressure, which is to an extent constant. This pain is referable to the whole of the pharynx, but we must bear in mind that while the separate follicles are the seat of the most marked hyperplastic changes, there is a certain amount of diffuse lymph tissue throughout the whole of the mucosa proper. In addition to this, there is an undoubted addition to the amount of blood circulating, not only in the mucous membrane, but in the diseased follicles. Hence, this varying condition of blood pressure will account for the neuralgic symptoms to which the disease gives rise.

Most writers mention hoarseness as indicative of follicular disease of the pharynx. Now hoarseness is usually an accompaniment of catarrhal inflammation of the larynx, whereas this affection does not, I think, in any case give rise to any extension of the catarrhal process into the air passages below. The vocal weakness, I think, is really to be considered an impairment of muscular action in the larynx, due to a reflex disturbance acting through the pharyngeal plexus of the sympathetic, and thence upon the motor innervation of the laryngeal muscles. In this way the voice, while apparently preserving its tone, seems to weaken and break down under any unusual or prolonged use, and especially in the nicer manipulation of tones of the singing voice. In the same way the muscles of the pharynx are slightly hampered in their action, so that deglutition, while per-

haps not especially difficult, is not accomplished with perfect ease and facility, the act also being accompanied with some little discomfort, owing to direct pressure on the diseased tissues. This is particularly true in that form of the disease in which the lateral masses of glands are involved, the so-called pharyngitis lateralis.

Cough usually accompanies the disease. Weather and climate seem to have little influence except so far as they affect the general health. Liability to cold, or acute exacerbations, is not usually observed, nor does this affection appear to bear any close relationship to simple catarrhal inflammations involving the upper air passages. It is more frequently met with in the lower walks of life, where poor hygienic surroundings, improper clothing, etc., tend to develop that peculiar condition under which the lymph structures take on that morbid activity which is so closely allied to scrofula.

Diagnosis.—I am disposed to think that there has been no little carelessness exercised by physicians in their examinations of those portions of the fauces which are seen on direct inspection; I do not think that this examination should ever be made without the use of the concave reflecting mirror. When this is used the diagnosis becomes a matter of exceeding simplicity. The mucous membrane of the oro-pharynx has the pinkish-white tint of an ordinary healthy mucous membrane, while scattered about over its surface and projecting from it will be observed a number of bright red masses of a rounded contour and shining aspect, which constitute the diseased follicles, standing forth in marked contrast with the normal mucous membrane upon which they rest.

The tonsils are usually somewhat enlarged and the uvula is elongated; this, I think, is more apt to be the case when the pharyngeal disease is complicated with naso-pharyngeal catarrh.

Prognosis.—The disease is essentially a chronic one; it gives rise to no changes in the air passages beyond. It is practically a local disease from its outset, and remains so during its whole existence. I am confident that the area of distribution of the disease is in the lymph follicles in childhood, and that no genuine extension is possible in adult life. Furthermore, I have never seen anything in the laryngeal mucous membrane which warranted me in making a diagnosis of true follicular disease in that region.

What the ultimate history of these follicles is, it is not easy to determine. Probably the same retrograde movements which we have already described continues until they disappear or cease to give rise to any symptoms. Their history goes through the whole period of middle life, and extends over a period of twenty-five or thirty-five years.

Treatment.—That measure which accomplishes the least destruction to surrounding healthy tissues is the one which will commend itself most favorably to our consideration. For this purpose we may use chemical agents, the actual cautery, or the galvano-cautery. Of these the chemical agents, of which nitrate of silver and carbolic acid are usually employed, are objectionable, as their action is feeble and cannot well be circumscribed.

The clinical indications are perfectly clear to destroy the follicles and they are best destroyed by the galvano-cautery. Of course in a pharyngitis lateralis the destruction of tissue is necessarily somewhat extensive, and the inflammatory reaction is more severe, but it is not usually a source of much trouble except in nervous women, in whom this procedure is liable to give rise to a considerable degree of constitutional disturbance. As a rule, it is perfectly feasible at a single sitting to destroy all the follicles, although it is well to go over the pharynx at intervals of a week, until ocular inspection shows them to have been competely eradicated. Of late years, I have used an instrument with a small point, which, when heated to a red heat, can easily be made to pass directly through the whole mass of the enlarged follicle, and indeed through the whole thickness of the mucous membrane. If necessary, if the follicle is large, or if it is a broadened plaque, a number of these punctures may be made. The result of this is the complete destruction of the follicle, while at the same time the inflammatory reaction is reduced to a minimum. Lennox Browne attaches a certain amount of importance to destroying the blood-vessels which are seen coursing in the superficial tissues of the pharyngeal membrane, thus cutting off the blood supply from these masses. The difficulty about this, of course, is that we lack evidence to show that these blood-vessels, which are visible in the pharyngeal membrane, are the nutrient vessels of the follicles, and furthermore, the destruction of the tumor itself is quite as easy, and a much more prompt and direct method of eradicating the disease. In addition to the mere destruction of tissue, I think in many cases certain general measures for the correction of the constitutional habit are indicated. These consist in the administraton of general tonics, such as barks and iron, strychnine, etc., together with cod-liver oil, hypophosphites, etc. These measures, however, will be carried out according to such clinical indications as appeal to the ready intelligence of every practitioner. It has been a standing practice among specialists to interdict the use of tobacco and alcohol, in all forms of catarrhal diseases of the upper air passages. I think this is scarcely called for, as there are after all patients who have been addicted to the use of one or both, and to make a sudden change

is unnecessary, and may even be harmful. In this disease I question if the use of alcohol has any effect in one way or the other, unless we have a complicating pharyngitis or stomach disturbance, and even in this case I think the influence of the habit is not marked. The use of tobacco, on the other hand, seems to have a notable influence on those affections of the upper air passages which are characterized by lymphatic hyperplasias, such as tonsillitis and naso-pharyngeal catarrh, as well as follicular disease of the pharynx. While, then, a patient is under treatment, I think it wise either to interdict or curtail the use of tobacco until a cure is completed. After this has been accomplished, of course, the habit may be resumed with impunity for, certainly, while the use of tobacco may aggravate an existing follicular pharyngitis, it can in no way produce it *ab initio*.

CHAPTER LIV.

ACUTE INFECTIOUS PHLEGMON OF THE PHARYNX.

This is a name given by Senator to a curious and usually fatal disease, in which the prominent local manifestation is a phlegmonous inflammation commencing usually on one side of the oro-pharynx, and extending through the food and the air passages beyond; it terminates in death at the end of from five to ten days.

Our knowledge of the disease is based on eleven cases reported by general authorities.

Etiology.—The curious clinical history of this malady impresses upon Senator the idea of its infectious character; the investigations, however, failed to determine the existence of any other bacillus than one similar to the staphylococcus albus, and small numbers of the streptococcus.

We accept its clinical history as evidencing the fact that it is due to a blood poison of a virulent character, the source of which must be, for the present, regarded as somewhat speculative. That it is an entirely distinct affection from erysipelas must be accepted, on the ground not only of its clinical history, but in the absence of any evidence of a contagious source of the disease.

In one or two instances, there may possibly have been a local cause for the affection, in the form of a mild traumatism. Thus, in Senator's first case, the attack seemed to come on almost immediately upon taking a glass of cold beer when overheated, while in one of Landgraf's it followed soon after the deglutition of a somewhat large bolus of food. We thus have suggested, perhaps, an analogy between this affection and that rare malady, phlegmonous gastritis, which, as we know, arises from apparently trivial exciting causes.

The disease belongs to adult life, all the cases reported occurring between the ages of twenty-three and fifty-eight, and generally in individuals in apparently perfect health.

Pathology.—The primary stage seems to consist in an active acute inflammation, starting usually on one side of the oro-pharynx. This rapidly degenerates into a purulent infiltration, involving the deep layers of the mucous membrane. This pus infiltration seems to

remain a pus infiltration to the end, in that in no instance has there been recorded any evidence of abscess formation in the tissues originally affected. The extension of the purulent infiltration seems to make its way along the great vessels, with a more marked tendency to extend downward than in any other direction. While the local disease of the pharynx changes rapidly into a purulent infiltration, this does not seem to extend along the mucous channels, as such, although there extends down the œsophagus, and into the stomach, and even into the intestines, a very active inflammatory process, verging on a proliferative inflammation. The same process, involving the air passages, takes on a somewhat œdematous character, giving rise to serous infiltration, together with active hyperæmia, involving the more loosely connected mucous membrane of the epiglottis, the ary-epiglottic folds, and the ventricular bands, while in other portions, as in the trachea and bronchi, the process still remains an acute inflammatory catarrh. The morbid process, however, in the mucous membrane, whether in the air or food tract, is a low grade of inflammatory action, in which the venous hyperæmia is prominent, giving a dull red, purplish hue to the membrane, and the same is true of the morbid process which is met with in the liver, spleen, and kidneys. Apparently as a secondary effect of the pus infiltration of the pharynx, we have the lymphatic glands of the neck, either on one or both sides, much swollen and infiltrated, while the cellular tissue also is infiltrated to such an extent in many instances, as to cause a swelling of sufficient size to fill up completely the angle between the jaw and the neck. In rare instances this extends down as far as the shoulder. This infiltration is of an inflammatory character, rather than suppurative, except so far as it extends along the great vessels of the neck. The morbid process in the pharynx, in nearly every case, has commenced on one side, and curiously enough, this has been usually the left, although in some instances it seems to have been bilateral. Commencing unilaterally it rapidly develops to such an extent as to involve both sides.

Symptomatology.—The onset of the disease, in every case, seems to be quite abrupt, the first sensation usually experienced by the patient being a sharp pain, referable to the faucial region, especially marked in deglutition. The pain is of a lancinating character, and simulates the feeling of a foreign body lodged in the throat. This may last from twelve to twenty-four hours, when there is an access of febrile movement, characterized by chilly sensations, pains in the bones, loss of appetite, and general malaise. The local symptoms in the throat now become more severe in character, the inflammatory process in the pharynx increasing in a marked degree so as to render

deglutition, even at this period of the attack, exceedingly difficult, while the morbid process extends to the mucous membrane of both the œsophagus and air tract. At the same time the septic character of the disease is manifested by an involvement of the lymphatics, primarily of the side affected, which is followed very soon by a similar infiltration of the lymphatics of the other side. This swelling of the tissues of the neck may attain to a considerable size, giving rise to a somewhat hard, brawny tumefaction, not unlike that of a diffuse cellulitis, although the skin is not usually discolored. The febrile movement assumes rapidly a very grave type, in that the temperature may rise to 103° F. or more, on the second day, while the evidence of the marked systemic invasion is shown by the occurrence in nearly all the cases of more or less well-marked delirium at this stage of the attack. The pulse becomes weak, thready, and exceedingly rapid; indeed, the whole aspect of the attack, as a rule, by the second, or, at the latest, by the third day, would seem to show that the system has been invaded by some acute blood poison of an infectious character.

As the local morbid process extends into the air passages, it gives rise to an œdematous infiltration of the more loosely attached areas of mucous membrane in the larynx, causing marked dyspnœa, while its further extension into the bronchial tubes is evidenced by the secretion of mucus or muco-pus. The voice, also, early becomes affected, assuming a peculiar piping character.

The morbid process also extends to the intestinal tract, and may cause profuse diarrhœa.

Albuminuria seemed to occur in the majority of the cases in which the examination was made, which is to be explained by the parenchymatous character of the inflammation occurring in the kidneys.

As before stated, the inflammatory process in the pharynx develops into a purulent infiltration comparatively early in the disease. This, however, does not seem to extend to the mucous membrane of the air passages, but makes its way along the course of the great vessels. The mediastinum was invaded in one case, pleurisy supervened in another. Dyspnœa is usually a prominent symptom at the onset of the disease. A scarlatina-like eruption has been known to occur, as have swelling and pain of the joints.

The onset of the disease seems never to have been marked by a decided chill, but rather by obscure chilly sensations, which continue during the progress of the affection.

The subsequent development of the malady varies only according to the areas invaded by the local inflammatory process, while the systemic symptoms, as evidenced by the febrile movement and general prostration, continue unchanged to the end, delirium becoming,

perhaps, more active and the general failure of the vital powers being noticeable. In several of the cases reported, the fatal termination seems to have been preceded by an apparent amelioration of all the symptoms, both general and local.

Diagnosis.—There is nothing in the morbid appearance on inspection of the fauces at the onset of this affection, to give warning of the exceedingly grave malady with which we have to deal. The diagnosis, therefore, must be based on the rapid development of a phlegmonous character in the local morbid process, together with the grave constitutional symptoms which occur early in the history of the disease. In no single instance, so far as I know, has the character of this affection been recognized on inspection before dangerous symptoms set in; nor, with the knowledge already gained from the few cases recorded in literature, is it possible to establish a diagnosis merely from local inspection at the commencement of the attack. Certain local appearances may be recognized as indicative of septic disease, the most prominent of these, perhaps, being the peculiar color of the membrane, which is of a dark red, verging on a purplish hue, in connection with an active, acute inflammation. The surface of the membrane, also, is of a dull, somewhat opaque appearance, in contrast to the glassy, semi-translucent condition met with in ordinary idiopathic inflammation.

The peculiar character of the pain which accompanies it may perhaps be suggestive, in that it occurs mainly on deglutition and is of a sharp, lancinating character. The swelling of the membrane, also, may be an important diagnostic factor, as usually occurring on but one side and being marked in character, the membrane projecting to a considerable extent forward into the pharyngeal cavity. The rapid extension of the inflammation should also excite apprehension.

Pain on pressure is always present. The early occurrence of the profound impression on the general system, as evidenced by the rapid and thready pulse, high fever, and especially the delirium, constitute symptoms which, when manifested, should immediately suggest this disease, especially when taken in connection with the occurrence of engorgement of the neck, this tumefaction being of a diffuse character, and one in which the individual glands cannot be recognized.

The presence of albuminuria, as well as enlargement of the spleen and liver, should be regarded as somewhat corroborative symptoms.

Prognosis.—The disease is an exceedingly fatal one, and runs its course in a comparatively short time. The only recovery which has yet been reported was in a case observed by Hager in a man aged thirty-nine, in whom the disease lasted forty-one days. In all the other cases death ensued, usually on the fifth or sixth day.

TREATMENT.—We know of no remedy whose action seems in any way to arrest the progress or to ameliorate the virulence of the infective poison which is the undoubted source of the disease.

The scarification of the pharyngeal mucous membrane, followed by the application of nitrate of silver to the open wounds, would commend itself in the early stage of the disease as offering fair hope of mitigating the severity of the attack, if not of arresting its progress.

In Hager's case which recovered at the end of forty-one days, the treatment was essentially symptomatic, although the drugs to which he attributed the best results were antipyrin in controlling the febrile movement and brandy freely used to sustain the vital powers.

It would seem that the tendency to death is due to the blood-poison, rather than to any direct or remote results of the local inflammatory process. To combat this condition, the free use of stimulants is demanded in connection with antipyretics, creosote, quinine, and other drugs of this character, as may be indicated.

CHAPTER LV.

RETRO-PHARYNGEAL ABSCESS.

This name is used to designate a phlegmonous inflammation in the lower pharynx, which results in the formation of an abscess. The definition might also embrace a pharyngeal quinsy; the former, however, has no connection with the rheumatic habit, as is the rule in quinsy. In acute infectious phlegmon we meet with pus formation in this region, but this is invariably due to a specific poison.

Etiology.—We are compelled to embrace under this classification a series of disorders which apparently have no direct clinical connection. The teaching that a retro-pharyngeal abscess is nearly always due to caries of one of the vertebræ or of the occipital bone, has received general acceptance up to comparatively recent times. Now, however, we recognize the fact that it really occurs more frequently as an idiopathic affection. It may also be as a sequel of one of the exanthems, or the result of a burrowing of pus from neighboring parts. Bokai, who has made a most elaborate study of the disease, covering an analysis of two hundred and four cases, finds that one hundred and seventy-nine were idiopathic.

Further than this it is exceedingly difficult to assign any definite cause for the disease. It occurs as a rule in healthy young children. It is not confined to early life, however; in my own practice I have seen it as late as the age of thirty-seven. An ulcerated tooth was supposed to be the cause in a case of Agnew's. How the burrowing of pus from caries of the spine, or the presence of foreign bodies in the pharynx, may lead to the formation of pharyngeal abscess is quite clear.

Sex seems to exert no influence.

Martin reports a case occurring in adult life, which seemed to be due to tertiary syphilis. The sequence of events appeared to be a suppuration of the cervical glands, and subsequently the development of a similar process in the lymphatics of the lower pharynx.

We find that, when we study this disease in adult life, we are confronted with the fact that each case is somewhat unique, and that to establish any general rules of causation becomes impossible. In

child life, however, we meet with a very large number of cases which present a somewhat definite and harmonious clinical history, in which the causation of the disease can be estimated with a certain amount of definiteness.

Among the local causes, then, we recognize the presence of foreign bodies, the local inflammatory changes in the exanthemata, such as measles, scarlet fever, and diphtheria. Lewandowsky thinks that in scarlet fever the pharyngeal abscess may be traced to a diseased condition of the nose. Whether the irritation be direct from the pharyngeal lymphatics or indirect from the nasal lymphatics, the conclusion seems fairly well established that the pharyngeal abscess arises primarily from inflammation and suppuration of the lymphatic structure. In the same manner, I think, we may find the primary source of irritation in a suppurative inflammation of the middle ear, as in the case reported by Wiel.

Pathology.—In forming an estimate of the true pathological changes which occur in a pharyngeal abscess, we must recognize the clinical fact that in adult life an abscess belongs essentially to the cellular tissue, while in child life a suppurative inflammation in the areolar tissue is comparatively rare. Furthermore, in child life the lymphatic tissues are in an active state of development, and therefore prone to take on diseased action; in adult life, on the other hand, these tissues shows much less liability to morbid changes.

As a matter of fact we find that the morbid process in retro-pharyngeal abscess in adult life differs in no marked degree from that which we describe in connection with an ordinary quinsy. When we come to study the disease in child life, however, we must adopt the view advocated by Bokai, that the primary seat of morbid change occurs in the lymphatic structures of the pharynx. The prominent clinical fact which seems to point to the lymphatic origin of the abscess is the slow development of the suppurative process, in contradistinction to the somewhat rapid development of the same process in the cellular tissues. In children the abscess generally forms either in one or the other side of the lower pharynx, and in rare instances in the central portion. Ordinarily the abscess forms in the visible portion of the oro-pharynx, rarely if ever extending above the border of the soft palate; although instances have been reported in which it extended downward behind the œsophagus. Thus, in one case it extended down to the level of the first and in another as far as the third dorsal vertebra. In a third case the pus made its way through the tissues of the neck, and opened at the level of the clavicle. These, of course, refer to instances of the disease in childhood. In adult life, if the disease be idiopathic, it usually involves the whole of the

retro-pharyngeal wall. When, however, it is due to the presence of a foreign body the abscess is actively progressive, and extends not only rapidly but uninterruptedly.

Symptomatology.—The clinical history and symptoms of a pharyngeal abscess in adult life and young children differ in a marked degree.

In Children.—The disease, as we have already seen, at this period of life is to be regarded as one of the manifestations of the strumous diathesis. Its development is somewhat insidious; there is loss of appetite, restlessness, a slight cough, but no prominent local symptoms. This may last for several days, when some evidences of throat trouble are shown in the slight cough, followed soon by a peculiar character of the voice, which Reigenier describes as "*cri de canard.*" Deglutition also becomes not only painful but even impossible; the child refuses the breast on account of its inability to swallow. Dyspnœa becomes a prominent symptom in the majority of cases, sooner or later, owing to the phlegmon pressing upon the posterior wall of the larynx, or overhanging it in such a way as to interfere with the entrance of air, and is closely followed by cyanosis, which is usually inspiratory, although when the tumor attains considerable size there may be interference with both movements of respiration.

So insidious is the onset of the disease in certain cases that attention may not be called to the existence of the localized disease in the pharynx for from four to six days, or even longer, after the commencement of the attack. In other cases, however, the very first manifestations of the disease may give rise to such prominent local symptoms as to call immediate attention to the pharynx. This is dependent, of course, mainly on the locality of the abscess.

In certain cases the abscess develops as low as the post-œsophageal space, and in such case, whereas deglutition is accomplished with comparative ease, dyspnœa becomes a somewhat notable symptom, being both inspiratory and expiratory. The position in which the child holds the head inclined forward, or bent to the opposite side, constitutes a symptom of certain diagnostic value; indeed, Albert goes so far as to regard this as almost pathognomonic.

In Adult Life.—When a retro-pharyngeal abscess develops in an adult, it makes itself known at its onset, as a rule, by well-marked symptoms, which call attention immediately to the existence of some morbid lesion in the faucial region. This probably is due to the fact already noted, that at this period of life the morbid process involves the cellular tissue. We know of no case in which in an adult it has been caused by spinal caries. Hence we regard it as an acute inflammatory process, of the nature of quinsy, without rheumatic taint as a

predisposing cause. The first symptom, therefore, to which it gives rise will consist of pain referable to the faucial region, aggravated during deglutition. Moreover, its onset is marked by notable general disturbance of a febrile character (101° to 102° F.), differing from the process in child life, when evidences of acute febrile movement are usually absent at the onset, although, as the disease progresses, a low form of fever sets in. The symptoms, of course, vary somewhat according to the locality of the abscess. In a case reported by McCoy, the phlegmon, developing in the pharyngeal wall, extended finally from the level of the larynx to the pharyngeal vault, giving rise not only to difficult deglutition, but to regurgitation of food; this, however, is not common. These pains are deep-seated and constant, and increase with the development of the disease, until the abscess ruptures. Dyspnœa, so far as I know, is rarely if ever present, and the general health is not seriously impaired.

Diagnosis.—In adult life, we find the appearances of ordinary phlegmon produced, which, if the abscess exists on either side of the fauces, will give rise to an asymmetrical condition of the parts with the characteristic tumefaction; the bulging portion presenting a bright red, somewhat glazed aspect, with the peculiar contour of abscess formation. The diagnosis, of course, may be established by palpation. Additional information is obtained by the impact of the probe, in that the small area immediately about the point of contact becomes exsanguinated or bleached out on pressing the probe into the parts, the blood returning slowly after the pressure is relieved. This, I think, is peculiarly characteristic of phlegmonous inflammation, especially after the abscess has formed.

In child life, a retro-pharyngeal abscess, as we have seen, is not the result of phlegmonous inflammation, but is of a more chronic character; hence the formation of pus is not attended with any active localized inflammation; in fact, the tissues about the abscess, and the mucous membrane covering it, present very slight evidences of the morbid process. Hence our recognition of the existence of the abscess must be based entirely on the asymmetrical condition of the parts, and the recognition of a pouching tumor encroaching upon the lumen of the pharynx. Having established by ocular inspection the existence of this tumefaction, its fluid character is recognized by palpation and probing.

The above refers to the ordinary type of cases; the diagnosis, however, is by no means so easy in those exceptional cases which present a different array of symptoms. The existence of an abscess in the cervical region should always suggest the possibility of a similar condition of things in the pharynx, and lead us to make a thorough

inspection of the latter region. This is not confined to the disease as it occurs in children.

There are no important points to be made in connection with the question of differential diagnosis, although we are usually informed of the danger of mistaking a retro-pharyngeal abscess in a child for croup, bronchitis, or œdema of the glottis.

A phlegmonous abscess in adult life presents no special difficulties or dangers of mistaken diagnosis, other than those to be discussed in connection with the subject of quinsy. Mention should, however, be made in this connection of the possible danger of mistaking an aneurism for an abscess, as in a case reported by Duke in which an aneurism, pouching into the pharynx, was opened in search of pus, with the result of almost fatal hemorrhage, although the patient's life was eventually saved by ligature of the common carotid artery.

Course and Prognosis.—When the abscess is the result of a phlegmonous process, it runs its course in from five to ten days, discharging itself spontaneously unless it has been previously opened by surgical interference. It involves no special dangers to life, and is attended with no grave complications, other than those discussed in the chapter on quinsy. If the disease be due to a suppurative process in the lymphatic structures of the pharynx, it runs a somewhat chronic course, its duration extending usually from two to four weeks. And whereas the mere existence of this lesion is an indication of the strumous habit which should render the prognosis somewhat grave, as a rule these cases do not succumb, provided the character of the disease is recognized; and while the disease in itself does not tend necessarily to a fatal result, complications may arise to hasten this end. In cases reported, the immediate cause of death was œdema of the glottis and suffocation from spontaneous rupture of the abscess, the pus making its way into the air passages; and erosion of the large arteries of the neck by the burrowing of the pus.

When retro-pharyngeal abscess occurs in young children of strumous habit, pulmonary troubles frequently constitute a very serious complication of the disease, especially when there is respiratory obstruction. Temoin has reported two instances in which the immediate cause of death was broncho-pneumonia. Bokai seems to think that this complication arises from the penetration of pus into the air passages, although quite as rational an explanation would seem to be in the respiratory obstruction, this acting to produce pulmonary lesions in much the same way as an attack of membranous croup.

Œdema of the glottis is also a frequent complication, though it is not necessarily fatal.

We find, therefore, that while the affection runs a somewhat pro-

tracted course in instances of lymphatic abscess, death is not a foregone conclusion except from complications that may occur, or in the failure to make a diagnosis.

In those cases in which the disease is symptomatic of caries of the vertebræ, the affection develops rather insidiously, and extends slowly by burrowing along the course of the vertebral column, and may extend down behind the œsophagus as far as the second or third dorsal vertebra, as in a case reported by Ripley.

In one observed by Mercier, the caries was known to have been present eighteen months, whereas the pharyngeal abscess had existed only a few weeks. The caries in this case was due to an injury, and the child eventually recovered. In a case reported by Chapin, the disease lasted six months, the abscess forming apparently early in its history, and yet it was never visible in the pharynx and was discovered only post mortem.

The prognosis in these cases is usually fatal, the caries of the spine being dependent upon a strumous condition, which renders the pharyngeal abscess merely symptomatic and complicative; the only instance of recovery that I recall being that of Mercier, in which the vertebral disease was of traumatic origin. The immediate cause of death in these patients is practically the same as in the lymphatic abscesses, either by inanition, suffocation, or a complicating bronchopneumonia.

Treatment.—If the abscess be of the phlegmonous character, such is is met with in adults, it should be evacuated as soon as the existence of pus has been determined, or the parts scarified even before the pus sac has been recognized. When the disease is due to suppuration of the lymphatic tissues of the pharynx, the same procedure should be followed. The abscess should be opened at the most dependent portion of the sac, but it is to be borne in mind that a large amount of pus pouring into the air-passages of an infant is likely to make its way into the larynx and trachea below, with dangerous consequences. Hence, the child should be held in an inverted position as soon as the pus begins to flow, in order to avoid this danger. As we have already seen, suppuration of the lymphatic glands of the pharynx is very intimately associated with a morbid condition of the cervical lymphatics, and is occasionally attended with a similar process in this region. When this latter condition exists, of course the opening should be made externally, and the incision carried sufficiently deep to evacuate the pus accumulation in the pharynx. Trélat made the opening completely through from the pharynx to the neck, thus establishing external drainage. Burckhardt goes so far as to advise that in all cases of retropharyngeal abscess due to sup-

puration of the lymphatics, the opening should be made externally through the tissues of the neck. He makes his incision along the anterior border of the sterno-mastoid muscle, and, crowding the great vessels to one side, goes on till the pus sac is reached. The operation is a comparatively simple one, and can easily be accomplished by means of an ordinary bistoury. If the child cannot well be controlled otherwise, a few whiffs of chloroform should be administered.

If after the discharge of the pus there still remains lymphatic engorgement, it may be wise to make use of external applications of iodine, in some of its various preparations, to dissipate this. The main indication, however, after the evacuation of the abscess, is the building up of the system by the administration of tonics, the best of which is cod-liver oil with syrup of the iodide of iron.

In the treatment of a disease which is dependent upon a caries of the vertebræ, the indications are practically the same as those already suggested in connection with a lymphatic abscess, viz., the early evacuation of the pus. It should be borne in mind, however, that the purulent accumulation in the pharynx is merely symptomatic of the graver form of disease which lies behind it, and that, while the local complication threatens serious danger in the way of obstructed respiration, dysphagia, or pulmonary trouble, the serious feature of the disease is a caries of the spine, which usually terminates fatally. We have already noticed the peculiar feature in certain cases, that the abscess, while not producing dysphagia, presses so far on the trachea as to give rise to marked dyspnœa. This would seem to suggest that in tracheotomy the tube should be inserted as low down as can conveniently be done.

CHAPTER LVI.

ACUTE UVULITIS.

The pendulous portion of the velum palati may occasionally become the seat of an acute inflammatory process.

Etiology.—The prominent predisposing cause lies in the size of the normal organ. For instance I have never seen an acute uvulitis in a rudimentary uvula. On the other hand, when the organ is broad and pendulous, it is very likely to become the seat of repeated attacks of acute inflammation, which are usually excited by taking cold. We have rather insisted heretofore on the point that repeated attacks of acute inflammation are really a symptom of chronic inflammatory action. This is true to a certain extent of the uvula, which we occasionally find in a state of chronic inflammation in connection with chronic pharyngitis or naso-pharyngeal catarrh.

Lennox Browne takes the ground that it frequently accompanies the arthritic habit and is also accompanied with disturbances of the digestive apparatus; even as pharyngitis is usually associated with a disordered condition of the stomach.

Probably the most frequent cause of it is an attack of quinsy, the œdematous uvula filling up a large portion of the space left between the peritonsillar abscess and the faucial wall of the opposite side.

It frequently comes on in connection with an acute pharyngitis, in which case it usually develops quite early in the course of the attack and rapidly assumes distressing features, giving rise to pain on deglutition and even dyspnœa with suffocative attacks.

In a larger proportion of instances probably it occurs spontaneously and without any involvement of the surrounding tissues, the first symptom that the patient experiences being a sensation of a lump or foreign body in the fauces, followed soon by more or less discomfort or pain in deglutition. As the organ increases in size, it gives rise to an irritating cough with dyspnœa, and perhaps suffocative attacks, dependent on the extent to which it encroaches upon the faucial isthmus.

Traumatism also is an occasional source of the attack, as it may follow the accidental swallowing of hot water, ammonia, oxalic acid,

or other chemical irritants, and the ulcerative processes in the pharynx, especially the deep ulcers of syphilis.

Pathology.—The changes which occur in the organ are essentially those of acute inflammation, in which the serous exudation of the second stage assumes unusual prominence. The morbid process is confined also almost entirely to the mucous membrane, although the azygos muscle is probably infiltrated to a certain extent.

Diagnosis.—The condition is easily recognized. On inspection the uvula will be seen presenting a large, rounded mass hanging freely into the fauces, of a bright red color where it is attached to the palate, and presenting all the evidences of acute inflammation. The lower portion of it, however, exhibits the whitish-gray, semi-translucent aspect, so characteristic of œdematous inflammation. At times, the tension on the mucous membrane is so great that it gives rise to a vascular stasis, causing the part to appear dark red or purplish.

Prognosis.—An œdematous uvula does not give rise to anything more than distressing and somewhat threatening symptoms at the time of the attack. I know of no fatal case having occurred.

Treatment.—The first resort in all cases should be free puncture by means of a slender, sharp-pointed bistoury. These punctures, to the number of ten to twenty, if necessary, should be made over the whole of the organ, especially round the lower portion and upon its posterior surface if such can be reached. It is rarely necessary to penetrate more than through the superficial layers of the mucous membrane, to the depth of perhaps one-eighth of an inch. In this way there will follow a free flow of serum, with the result in most instances of marked and immediate relief, and the total disappearance of the œdema in the course of a few hours. Although the letting of blood by the puncturing is not especially indicated, there is, of course, no objection to it.

Puncturing I regard as a far better procedure than linear scarification.

In aggravated cases scarification may fail to give immediate relief. Amputation of the uvula will give complete relief in these instances.

In my own experience cocaine is of little avail in a well-developed condition of œdema.

Chronic Uvulitis.

We occasionally find the mucous membrane covering the uvula in a state of chronic inflammation, as evidenced by its reddened color and semi-relaxed condition. I have never seen an instance in which this condition was primary. It occurs most frequently in connection

with chronic pharyngitis or chronic naso-pharyngitis. It also is met with in certain instances in connection with an elongated uvula. This is the condition which is often referred to by the term relaxed sore throat. It possesses no special clinical significance, gives rise to no symptoms which are to be directly attributed to the inflammation of the mucous membrane, nor does it usually call for any direct local treatment.

CHAPTER LVII.

ELONGATED UVULA.

The pendulous uvula in a healthy throat should hang freely in the faucial isthmus, but should not impinge upon the parts below. When, on the other hand, a uvula hanging from the edge of the palate impinges upon the base of the tongue, epiglottis, or parts below, it should be regarded as an abnormality.

Etiology.—I believe in most instances the condition is primarily congenital, but of course as a consequence of repeated attacks of inflammation in later life the elongation is increased.

Pathology.—I have never known a case in which the azygos muscle was involved in an elongated uvula. The central portion of the mass is made up of the white fibrous and yellow elastic tissue which is found in the lower portion of the normal uvula. This is traversed by numerous blood-vessels, while externally the mass is covered with healthy mucous membrane, somewhat loosely attached to the tissues beneath. The elongation occurs from above downward, and as the organ becomes elongated it maintains, as a rule, its original diameter. I do not think that we ever have any lateral growth in an abnormally long uvula.

The length of the uvula varies of course in different persons.

Symptomatology.—The symptoms to which this condition gives rise vary greatly, but there is usually a sense of irritation or tickling in the fauces, with the feeling of a foreign body, which the patient constantly endeavors to expel by hawking or clearing the throat. As the parts become more sensitive a cough may be set up.

Deglutition and phonation are not notably affected; if, however, the organ becomes of such length as to impinge upon the larynx, a chronic laryngitis may be the result, in which case the voice is notably impaired. A perfect singing voice demands that every portion of the upper air tract shall be in a condition of health. It is easy to understand, therefore, how a singer might be seriously hampered by the existence of an abnormally long uvula.

Attacks of suffocation or spasm of the glottis are by no means

uncommon in connection with this condition, especially in patients of nervous temperament.

The cough is usually dry, irritating, and persistent, and not ordinarily accompanied by any expectoration unless complicated by catarrhal inflammation in the fauces. An especial feature of the cough, as well as of the other symptoms is the exacerbation on lying down. In the recumbent position the uvula lies upon the posterior wall of the pharynx and may give rise to cough, choking attacks, or spasm of the glottis.

In an interesting case which came under my observation an elongated uvula gave rise to repeated paroxysms of asthma, not of a very severe type, but accompanied with sibilant and sonorous bronchial râles. Uvulotomy gave complete relief, and there was never a recurrence of the asthma.

Diagnosis.—It would seem an exceedingly easy matter to recognize an elongated uvula on simple inspection of the fauces, and yet it may often be a question whether the uvula is of sufficient length to give rise to morbid symptoms. If any symptoms are present referable to the fauces, I think it quite safe to act upon the rule that the normal length of the uvula in an adult is rarely over three-eighths of an inch.

Prognosis.—This condition involves no grave danger but it is not a condition which tends to recovery. To one accustomed to use the higher powers of the voice, viz., in singing or recitation, the prognosis as regards preservation of the voice is, I think, somewhat unfavorable. The constant presence of an abnormally long uvula not only temporarily impairs the singing voice, but tends to give rise to morbid changes in the air passages below, under the influence of which not only does this impairment increase, but a serious danger of permanent loss is threatened.

Treatment.—No local applications are of any avail whatever in the treatment of this affection. The only treatment that possesses any permanency is the removal of the superfluous portion. The removal of the entire organ I regard as an exceedingly unjustifiable and vicious practice.

The restless movements of the uvula, together with the arching of the tongue, occasionally render it difficult to grasp and control the organ. This seems to have suggested to Bell the construction of the guillotine, which consisted of a flat plate of metal with a rounded opening in its distal extremity, upon which a blade was made to slide. As soon as the uvula fell into the fenestra, the blade was driven home by a quick movement and the organ cut through before it was retracted by the palatal muscles.

Mackenzie has modified this instrument by adding a simple device for seizing the severed portion, while Elsberg constructed an instrument on the same general principles which acted by means of a spring; the instrument being placed *in situ* and the blade being drawn back, it was brought into play by simply touching a trigger.

A number of different forms of scissors have been devised; as a rule, these are the ordinary surgical scissors with the addition of a claw which shall seize and hold the cut portion of the uvula, thus preventing its falling into the passages below.

Seiler and MacDonald go still further, and curve the end of one of the blades of the scissors to a right angle.

These latter instruments are undoubtedly exceedingly useful, in that they prevent the uvula from slipping beyond the blade of the scissors, as may easily occur. The claw scissors should never under any circumstances be used; they serve to complicate what is really quite a simple operation, for if one attempts to amputate a uvula with such an instrument without first seizing it with the forceps he will in most instances not only fail in his operation but will inflict unnecessary distress on the patient.

I have referred to these instruments as the matter possesses a certain amount of interest; and yet practically I think that no special instruments are required for the operation. In my own practice for years I have contented myself with simply seizing the tip of the uvula with a pair of mouse-toothed forceps held in the left hand, and drawing it forward on the dorsum of the tongue, cutting the redundant portion off with a pair of the ordinary curved scissors. Care should be exercised not to draw too vigorously upon the organ, as in this manner the mucous membrane is drawn down in such a way that after the section is made it retracts, leaving a large cut surface protruding from the tip. It is also important, I think, in making the section to cut from below upward and backward. In this way, after the excision has been made the cut surface is entirely on the posterior aspect of the organ. The result is that in swallowing food and liquids the raw surface applies itself closely to the pharyngeal wall and is less liable to be irritated by the ingesta. This point I regard as one of exceeding importance, and, as will easily be perceived, this peculiar line of division is not secured by the uvulotome or the claw scissors. In most instances it is necessary to depress the tongue by means of the spatula. This instrument is easily held in the right hand while the thumb and second finger of the right hand are inserted in the rings of the scissors. As soon as the tip of the uvula has been properly seized by the forceps, the spatula is dropped and the scissors are brought into play. After the organ has been amputated

it is important to direct the patient to take for the remainder of the day no food containing salt, vinegar, pepper, or other irritating substance, and in addition to carry a small piece of gum arabic or elm bark in the mouth. In case of children, gum drops or fresh marsh mallows answer an equally good purpose.

If the organ is unnecessarily mutilated in amputation, the patient will suffer with a severe sore throat for days. I think, however, that in the majority of cases, if the operation is properly done, the discomfort which follows it need not last for more than from twelve to twenty-four hours.

Hemorrhage after Uvulotomy.—Uvulotomy is to be regarded as an exceedingly simple operation and one practically unattended with danger; and yet dangerous hemorrhage has followed the operation in a few reported cases.

It is not easy, however, to understand how hemorrhage from uvulotomy can be troublesome or difficult to control if the operation has been done at the proper point, viz., at a distance of three-eighths to half an inch below the border of the palate.

In the cases in which the whole organ was removed, the hemorrhage persisted for twenty-four hours. In those cases in which it is stated that only a portion of the organ was removed, the hemorrhage was as a rule readily controlled.

I think that in case hemorrhage follows uvulotomy, the ordinary hæmostatics are not to be depended upon, and our most reliable resort will be in the use of a clamp applied to the stump.

Morgan has devised an instrument on the principle of the serre-fine for use in these cases.

Speaking generally, it would seem that hemorrhage might be avoided by performing the amputation with the snare. Morgan advises the snare, on the ground that a better stump will be left. I am disposed to think, however, that the bruising of the tissues which accompanies the use of this instrument would give rise to a rather distressing sore throat.

While a serious objection to the complete removal of the uvula lies in the danger of hemorrhage, Shurley makes a still further point that one of the functions of this organ lies in supporting the palate during phonation by resting upon the base of the tongue; this support, therefore, is abolished in its complete removal, resulting in an additional labor and consequent fatigue to the palatal muscles in the use of the voice.

CHAPTER LVIII.

QUINSY, OR PERITONSILLAR ABSCESS.

The term quinsy is merely a corruption of the term *cynanche*, so extensively used in older medical literature to designate the various diseased conditions of the fauces which were characterized by an angina or obstruction of the parts. The term quinsy is here retained on account of its very general adoption and usage in literature.

We may define a quinsy as an acute inflammation of the tissues immediately surrounding one or the other of the faucial tonsils, which rapidly assumes a phlegmonous character and results usually in an abscess. In the large majority of cases the soft tissues immediately in front of the tonsil and the soft palate are involved. In others the inflammation develops behind the tonsil, and, extending backward and downward, an abscess is formed in the lateral walls of the lower pharynx. In still rarer instances the morbid process seems to start in the tissues immediately beneath the tonsil, giving rise to a suppurative process, which results in the formation of an abscess in this region, the pus making its escape directly through the deep layer of the tonsil into one of its crypts, and finally escaping on the surface of the organ itself. The point which I desire to emphasize is that this inflammation does not take place in the tonsil, but rather in the peritonsillar areolar tissue. During the course of the morbid process, however, the tonsil itself becomes somewhat involved in the inflammatory action, and is also elevated or crowded out from its bed in such a way as to give rise to the impression that the tonsil is the seat of disease. Hence, the name acute tonsillitis is often given to it.

Etiology.—This affection belongs essentially to the middle period of life.

That it should occur far more frequently in males than in females is easily understood, in that its common exciting cause is taking cold, to which men are necessarily much more exposed. The season has a very marked influence upon its development, for the same reason, viz., that, resulting from exposure to cold, it is far more likely to occur during the spring and fall months, when all diseases which

follow exposure are more prevalent. Mackenzie shows that in eleven hundred and seventy-six cases seen in a year in the London Throat Hospital, six hundred and one occurred in July, August, September, and October.

It is a matter of almost universal observation that it is an hereditary disease and runs in families.

It occurs rather in the lower walks of life, and among those compelled to live an outdoor life and labor in the open air.

We know of no exciting cause of the attack, other than an exposure to cold. Our interest, however, in the clinical history of the disease lies more largely in the active predisposing causes, and of these we must undoubtedly place first and above all the rheumatic habit. Indeed, I am disposed to make the assertion that a suppurative inflammation in the cellular tissue surrounding the faucial tonsil, in probably nine cases out of ten, should be regarded as a manifestation of rheumatism. This idea is by no means a new one, for while it has not received definite expression in the older literature of throat diseases, the reputation which the preparations of guaiac have obtained for the treatment of this affection, in long years past, must be accepted as a recognition of the systemic character of the disease, although this drug was used somewhat empirically.

That the existence of enlarged tonsils undoubtedly invites the phlegmonous inflammation to the surrounding tissues is a matter of very frequent clinical observation. I do not, however, regard an inert hypertrophied tonsil as so actively predisposing to quinsy as the subacute tonsillitis which not infrequently occurs in the organ.

An attack of acute follicular tonsillitis also very frequently precedes the phlegmonous inflammation, though in these cases I think we must recognize a particular predisposing cause in a rheumatic habit, or some other general dyscrasia, in that an acute follicular tonsillitis does not and cannot develop a quinsy without some particular predisposing cause. In the same manner we occasionally see an attack of scarlet fever or measles, or other of the exanthemata, give rise to an attack of quinsy.

In addition to the above, there are undoubtedly many cases which apparently develop spontaneously. We may simply say that impaired general health, irregularity of life, vicious hygienic surroundings, and other causes of this nature predispose to the disease.

Pathology.—The special pathological process which characterizes the development and progress of an attack of quinsy presents no especial features, so far as we know, which differ in any notable degree from the ordinary suppurative processes which are met with as occurring in the cellular tissue of any portion of the body.

The primary seat of the phlegmon is usually in the cellular tissue immediately above the upper border of the tonsil, in which case the tumefaction extends not only beneath the tonsil, but into the tissues of the soft palate; the centre of induration, after the phlegmon is fully developed, usually pointing nearly midway between the upper border of the tonsil and the side of the uvula, at its base. In other instances we find the centre of phlegmon developing apparently in the cellular tissues at the lower and posterior border of the tonsil, the inflammation in this case extending backward and downward, giving rise to a somewhat elongated or spindle-shaped phlegmon which extends down the posterior wall of the pharynx, along its lateral border. This may reach as far as the orifice of the œsophagus. In this case the phlegmon usually tends to point as low down as the level of the epiglottis, or even below it. Another locality in which the phlegmon may develop is in the tissues immediately beneath the tonsil. In this case the tonsil is lifted bodily from its bed, while the centre of suppuration develops in the structures beneath the tonsil, the escape of pus being usually into one of its crypts. In other instances we find the inflammatory process showing its greatest activity in the posterior pillars of the fauces, giving rise to a somewhat elongated phlegmon, which, however, usually extends no farther than the base of the tongue. In an analysis of 133 cases of quinsy under my care, the phlegmon occurred in the soft palate in 115 cases, in one or the other of the posterior pillars of the fauces in 11 cases, while in 2 the abscess developed beneath the tonsil, and discharged upon its surface through one of its crypts, and in two cases the posterior wall of the pharynx was involved.

The suppurative process in these cases usually expends itself in developing an abscess, which tends somewhat to extend in all directions around its original starting-point. The pus from a tonsillar abscess has been known to make its way into the cellular tissues of the neck as far down as the level of the clavicle. The question of course arises in connection with the latter cases, whether the disease may not have been acute infectious phlegmon, although in the latter disease we meet with suppurative inflammation rather than abscess formation.

As a complicating pathological lesion, a number of cases have been observed in which thrombosis occurred in the neighboring veins, in connection with pyæmia.

Symptomatology.—The attack is usually ushered in by a chill, or in rarer instances by well-marked chilly sensations. This is soon followed by a general febrile disturbance, the headache frequently being of an unusually severe type. The temperature at the onset of the attack reaches 102½° or 103° F., in rare instances 105° F.

Following these symptoms there is deep-seated discomfort in the fauces, referable usually to one side. This soon develops into a distinct boring pain, which is constantly present and aggravated by deglutition. It may persist for twenty-four to thirty-six hours, perhaps, before evidences of tumefaction set in, although usually the swelling occurs almost immediately. The localized swelling develops rather rapidly and the normal lumen of the fauces is notably encroached upon. Usually, at the end of twenty-four to thirty-six hours deglutition is almost impossible. The local inflammation causes an infiltration of the muscles of the soft palate and pharynx, so that their contractility is to a large extent destroyed and swallowing of solid food is impossible The mucous membrane covering the parts also becomes infiltrated, and the soft palate, and especially the uvula, becomes œdematous and increases the painful symptoms. At the end of twenty-four to thirty-six hours usually, a deep, throbbing, boring pain, which at times is almost unbearable, sets in. It is usually referable to the faucial region, though it courses up toward the ear and is frequently referred to that organ. As the result of the localized tumefaction the whole mucous membrane of the fauces is involved in a catarrhal inflammation with hypersecretion. The mucus accumulates in the fauces, the patient being unable to expel it owing to the semi-paralyzed condition of the faucial muscles. The voice is thick and muffled, and articulation difficult. Normal nasal respiration is interfered with and the senses of smell and taste are to a large extent abolished. The patient at this stage presents a picture of distress. He sits with his body bent forward, avoiding any movements of the neck, while the head is inclined forward to allow the saliva to drop from the mouth, as swallowing is almost impossible and very painful. Indeed, the whole aspect of a case of quinsy, when the phlegmon is fully developed in the fauces, with the expression of pain and suffering in the face, the heavy and sleepless eyes, and open mouth with the dripping saliva, presents a picture of misery which is striking and characteristic.

The symptoms above described are usually met with in connection with that form of quinsy which develops in the soft palate and confines itself to one side. The symptoms, as we see, are largely due to the existence of acute phlegmonous inflammation in the fauces. In other words, they give rise to localized pain and interfere with the normal functional movements of the parts. When the quinsy develops on both sides, we meet with an aggravation of all the symptoms detailed above, with the addition that not only deglutition but respiration is interfered with. In adults this interference with respiration is not always a prominent symptom, but in young people

there is danger of suffocation in double quinsy. When the tumor develops in one of the posterior pillars of the fauces, or in the lateral wall of the lower pharynx, it does not assume such large proportions, as a rule, as when it occurs in the soft palate. The pain, however, is usually quite as severe, if not worse, as is also interference with deglutition. Furthermore, the duration of the disease here is much longer than where it is met with in the softer tissues above. This is probably due to the fact that, while suppuration occurs quite as early in one region as the other, the abscess makes its way much more slowly to the surface through the denser tissues of the pharynx than through the soft tissues of the palate. The long fusiform phlegmon which characterizes a quinsy in the lateral wall of the lower pharynx may extend down, as before stated, as far as the orifice of the œsophagus, or may assume such proportions as to crowd upon the lateral wall of the larynx and produce a distressing dyspnœa. Of three cases of this form of quinsy which have come under my own personal observation, in one of them tracheotomy had become almost imperative, when I finally succeeded in evacuating the pus a few lines above the orifice of the œsophagus. The dyspnœa in this case was not due to any secondary involvement of the larynx by œdematous swelling, but solely to the mechanical pressure of the phlegmon.

A quinsy developing in the lower pharynx is, so far as my experience extends, unilateral, nor do I know of a case of double quinsy in this region having been reported.

When the phlegmon develops in one of the posterior pillars of the fauces, it does not usually assume large proportions and the symptoms are correspondingly mild. The pain, however, is usually very severe, and the sufferings of the patient, so long as it lasts, are exceedingly distressing.

Diagnosis.—At the onset of the attack, there is nothing in the local appearances which renders it possible to make a diagnosis by mere ocular inspection. At the end of from twelve to twenty-four hours, however, the local appearances are such as to render the diagnosis comparatively easy. On inspection, it will be seen that the parts present all the characteristic appearances of an active acute phlegmonous inflammation. The prominent feature is the swelling distorting the fauces and impairing its usually symmetrical appearance. The tonsil itself is the seat of a mild inflammation, while it is pressed forward and inward by the swelling beneath it. The activity of the inflammatory process, however, is evidenced by the appearance of the soft palate or the parts immediately above the tonsil. This presents a swollen appearance, while its color is of a distinctively

bright red tinge, verging on a purplish hue. This, of course, is characteristic of the most frequent form of quinsy, which involves the cellular tissue of the soft palate.

The most important information, however, is obtained by palpation. By this measure, the existence of the swelling, as well as the presence of pus, is easily detected, the mass being felt under the tip of the finger as the hard, dense, and slightly elastic tumor which we recognize as belonging to a phlegmonous process. In those somewhat rare instances in which the activity of the inflammatory process develops in the posterior pillar or in the lateral wall of the lower pharynx, the diagnosis must be made mainly by ocular inspection. The pharynx being fully exposed, the long fusiform swelling will show itself, lying in the one case in the posterior pillar of the fauces, in the other in the lateral wall of the pharynx, showing the presence of an acute inflammatory process, the tumefaction projecting forward into the faucial region. In this region, also, it is occasionally feasible to examine the parts by means of the index-finger; and when this is tolerated it should always be done, as affording additional evidence, not only of the presence of the phlegmon, but also of the progress which it has made toward suppuration.

The main importance of this manipulation is in determining whether suppuration has set in, and, if so, the place where the abscess tends to "point."

A certain amount of importance is attached, in the literature of quinsy, to the necessity of a differential diagnosis between this disease and the faucial manifestations of the exanthemata, diphtheria, acute follicular tonsillitis, fibrous tumors, malignant disease, aneurism, and gangrenous tonsillitis, or syphilitic disease of the pharynx. It would scarcely seem probable that any of these diseases could be confused with an attack of quinsy; certainly a mistake could scarcely occur if the parts are examined with sufficient care. As regards diphtheria and follicular tonsillitis, the existence of an exudation should eliminate the question of quinsy. As regards syphilitic disease, the only form of this which could contribute to an error in diagnosis would be the tertiary ulcer, the inflammatory areola of which, with its swollen membrane, may present something like the appearance of phlegmonous inflammation. The existence, however, of the ulcerated surface should, with careful examination, be determined. Ulceration, of course, never occurs with quinsy.

In the faucial manifestations of the exanthemata, the local inflammatory process does not develop in a phlegmonous form; hence these conditions need not be a source of error in diagnosis.

A differential diagnosis between a quinsy and an aneurism would

seem to be a comparatively easy matter, and yet a bistoury has been plunged into an aneurismal tumor with a fatal result, the operator thinking he had a quinsy to deal with.

As regards gangrenous tonsillitis, this is usually a superficial process and not attended with any notable tumefaction of the parts; however, gross inspection ought in all cases to make clear the character of such a pathological process.

Course and Prognosis.—A quinsy usually runs its course in from five to ten days, according to its location and the measures of treatment which have been resorted to to curtail or arrest its progress. Its course is not ordinarily attended with any especial danger to life, although it entails very great suffering to the patient. Its progress results in the development of a suppurative process in the centre of the phlegmon, which makes its way to the surface and escapes. After the pus has discharged, the active inflammatory symptoms disappear rapidly, and convalescence is practically established when the abscess discharges, any prominent symptoms due to the local morbid condition disappearing at the end of twelve, or, at the utmost, twenty-four hours after the abscess has been evacuated.

As a rule, I am disposed to think that we may anticipate the formation of pus at the end of the second or by the third day. Those cases which are long protracted ones, as when, for instance, a quinsy persists for ten days or two weeks, I think are due, not to the fact of a delayed suppuration, but to the fact that the abscess forms in dense tissue, and makes its way slowly to the surface. This is characteristic of those abscesses which develop in the pharyngeal wall, and, in a less degree, of those which develop in the posterior pillar of the fauces. The quinsy which runs its course most rapidly is that which forms in the tissues of the soft palate. The point of selection for superficial necrosis, or "pointing" as it is usually called, in the palatal abscess, is about midway between the upper border of the soft palate and the side of the uvula. When, however, we meet with a long fusiform phlegmon in the posterior pillar of the fauces or in the lateral walls of the lower pharynx, the abscess generally "points" in the more dependent portion of the tumefaction.

While, as we have stated, a quinsy is not considered a grave disease, and involves no serious and direct danger to life, in its regular progress, cases of death occasionally occur as the result of untoward accidents or rare complications. Perhaps the most frequent accident met with is when, the evacuation having been long delayed (in consequence of which the pus cavity has attained somewhat large proportions), spontaneous rupture occurs during the night and the pus makes its way into the air passages, causing death by asphyxia.

Allusion has already been made in the discussion of the pathology of the disease to the cases in which pyæmia set in, followed by death. Pyæmia, however, certainly is not a danger which we ordinarily anticipate in connection with a simple quinsy.

In the cases in which the pus showed a tendency to burrow in the deeper tissues of the neck death occurred in each instance. These also, we have heretofore suggested, may have been instances of acute infectious phlegmon.

Suffocation may occur from obstruction in the fauces. This danger, of course, is mainly confined to children in whom the faucial isthmus is so narrow that a complete occlusion is by no means difficult. In adults, interference with respiration only occurs as the result of a complicating œdema of the glottis or from secondary irritation of the laryngeal mucous membrane.

The destructive process goes on in quinsy as long as the abscess is confined, destroying everything in its way, and ceasing only with the evacuation of the pus. In its development, necessarily, it must encounter blood-vessels whose walls yield to the same destructive influence. When such an accident occurs, the blood-vessels being opened, hemorrhage ensues. The arteries which may be involved are the tonsillar, ascending pharyngeal, and internal carotid. The two former are rarely if ever involved; the position and relations, however, of the internal carotid are such that a peritonsillar abscess may involve its walls in the destructive invasion and give rise to dangerous hemorrhage. The exceeding gravity of this complication is evidenced by the fact that almost all the cases recorded have terminated fatally. In one case the extension of the abscess resulted in an erosion of the facial artery, causing a fatal termination.

Among the somewhat unusual results of a quinsy may be mentioned those instances in which the acute symptoms subside and the case develops into one of a chronic abscess, constituting practically an encysted abscess, as in three cases reported by Garel, in which the condition persisted for several months. In one instance a cure occurred spontaneously, while in the other two it was effected by the use of the galvano-cautery. The course of these cases was marked by repeated attacks of retention of pus, giving rise to painful symptoms for a time, after which a free discharge set in.

Treatment.—In this, as in all acute inflammatory affections, our first efforts should be made in the direction of aborting the attack. This can, I think, not infrequently be accomplished if the case is seen sufficiently early. I do not recall, however, an instance in which this effort has been successful later than twenty-four hours after the onset of the disease, and even at this stage it is somewhat rare,

although I think that from six to twelve hours after the characteristic pain has been recognized in the fauces there is very fair promise of arresting the further progress of the inflammation by proper measures. These have already been somewhat fully described in the chapter on taking cold.

Without waiting to ascertain the effect of the attempt to abort the attack, the patient should immediately be put under those remedies which experience teaches us exercise an almost specific action in the control of a phlegmon in the fauces, viz., anti-rheumatic remedies. Salicylate of soda should be administered as combining the action of the acid with the well-known action of alkalies upon the rheumatic habit.

Aconite aids notably in the treatment of this disease, and is therefore useful as an adjuvant.

Without waiting to observe the result of an abortive treatment, we immediately administer the following:

℞ Sodii salicylatis, ... ʒ ij.
Aquæ, ... ad ℥ vi.
M. S. One tablespoonful every hour.

With each dose of the salicylate there should be administered, to an adult, one drop of Fleming's tincture of aconite. The salicylate should be continued during waking hours, until a notable impression on the local symptoms has been obtained, unless it be contraindicated by gastric disturbance or some other complicating circumstance. The drop doses of the tincture of aconite are to be given until the constitutional effect of the drug is recognized by the characteristic tingling of the tips of the fingers and the lips, and the numbness in the fauces, if this can be recognized in connection with the localized pain. When these evidences are observed, the further administration of the drug is to be abandoned permanently, as I question if this remedy possesses any properties which act favorably upon the further progress of the disease, its action being confined practically to controlling the morbid process at the onset of the attack and in aiding to abort it. Furthermore, while the aconite treatment is of unquestioned value, it is to be regarded as secondary to that by the salicylates.

Green would seem to suggest that the drug is more efficacious in children—a point which is apparently well taken.

The salicylates we give thoroughly well diluted, in order to avoid, so far as possible, any local irritation to the stomach.

In addition to the above remedies, the patient himself should be supplied with a saucer of bicarbonate of soda. By simply wetting

the forefinger and dipping it into the soda, he can plaster the drug quite easily over the inflamed portion of the fauces. This can be repeated every half-hour; and I consider this of almost equal value with the internal administration of the salicylates. Clinical experience teaches us that it not only controls the local morbid process but that it also serves to mitigate, in a notable degree, the severity of the local pain.

The above plan of treatment, as has been suggested, is carried out at first in the effort to abort the disease; but even failing this, it constitutes the plan of treatment which is to be still further pursued, even in those cases in which we fail to arrest the affection. And even in such a case I think we will be convinced of the beneficial action of these remedies, in that when suppuration occurs this process is hastened in a very striking manner. Certainly in a number of cases which have come under my own observation I have been satisfied that the suppuration which set in on the second day was largely the result of the internal medication, in that we do not usually expect the abscess to form so early in a case of quinsy which has not been markedly influenced by therapeutic measures.

Atkinson, in laying down a specific plan for the carrying out of the alkaline treatment, states that "resolution is almost always brought about, and patients are, with scarcely a single exception, able to resume their duties about the fourth day." He administers twenty grains of the bicarbonate of potassium, together with fifteen grains of citric acid, in an effervescing draught every four hours, in connection with guaiac lozenges and tincture-of-iodine gargles, with mild stimulation and frequent alimentation.

The only further question of importancce to discuss in this connection is the resort to surgical measures. From the onset of the attack, the fauces should be repeatedly examined with the greatest care, both by inspection and digital exploration. This digital exploration should be made at least twice daily, and the evidence of softening and pus formation recognized, together with the point at which the abscess is approaching the surface.

Having established the existence of pus by digital palpation, a small, sharp-pointed bistoury should be plunged boldly into the mass for three-eighths to half an inch, the depth of the incision being dependent, of course, upon the locality and the recognized danger of reaching large blood-vessels. In making the incision, it is important that it should be of sufficient size to enable the pus to escape freely. If pus does not flow at the first incision, a silver probe should be inserted through the opening and carried in different directions with some little force in search of the pus sac. If the flow of pus is still

not established, additional openings may be made. The parts seem to a certain extent to lose their resiliency, and even with a free opening the pus does not always flow readily; hence it may become necessary to assist the flow, by means of a probe, until the cavity is evacuated. I have incised the phlegmon in a very large number of instances of quinsy, and in no case have I done it without a certain degree of nervousness on account of the proximity of the blood-vessels, and yet it seems to me that if one recognizes the true pathological condition, and has localized the suppurating point, one ought to feel confidence in the manipulation. When, however, we consider that so great a surgeon as Chassaignac, in operating upon a faucial phlegmon, wounded what was probably the internal carotid artery, necessitating a ligation of the common carotid, this would seem to be an accident that might happen to any one.

The further suggestion arises, as to the propriety of the use of the knife before evidences of pus have been obtained. Older writers advocate scarification of the tonsil in this disease. It is scarcely necessary to say that scarification of the tonsil is not indicated. I am confident, however, from a number of experiences, that much relief may be obtained by local blood-letting. This should be accomplished by a narrow, sharp-pointed knife, with which five to eight punctures should be made directly into the inflamed tissue, the knife being plunged in rather than swept across it.

In addition to these measures, no little can be accomplished in the way of relieving symptoms, and adding to the comfort of the sufferer, by attention to certain minor details. Prominent among these, perhaps, is the holding of a pellet of ice in the mouth, allowing it to lie against the inflamed parts, and also swallowing small pieces. Browne seems to think this may aggravate the trouble, although usually patients find it grateful. Gargling the throat with water as hot as can well be borne occasionally affords a certain amount of relief. The use of heat or cold is to be governed by the sensations of the patient. As to external applications in the form of poultices, hot compresses, cold compresses, ointments or liniments, and measures of that sort, I have little confidence in them; they add to the discomfort of the patient and are not to be depended upon to accomplish any good result.

The local effect of cocaine at best is but superficial, and I certainly should not regard it as a remedy to be depended upon.

After the abscess of a quinsy has been evacuated, the whole of the inflammatory process subsides and the indications for treatment disappear. It usually leaves no sequelæ which carry with them any indications for further therapeutical measures, unless perhaps we

include in this category those cases in which serious hemorrhage has occurred. The clinical history of these cases shows that the hemorrhage is apt to recur; hence, when such an accident has happened the case must be watched with the greatest care, and preparations be made for ligating the common carotid artery.

The clinical history of a case of quinsy, as we know, is that of recurrent attacks, during the spring and fall. In many cases this tendency disappears apparently without cause; the patient outgrows the habit, as we say. The existence of enlarged tonsils we recognize as one of the predisposing causes of the attack; hence it becomes our especial duty in all cases in which they are present to extirpate them if the quinsy habit exists. By this measure we do not always remove the habit immediately. I have not infrequently seen patients have a violent attack of quinsy after the removal of enlarged tonsils. I think, however, that the disposition to a quinsy disappears after the first or perhaps the second attack, following the excision of the tonsils. The only other indication for general treatment consists in the regulation of the general habits of living. For this purpose I have no practical suggestion to make, other than those already discussed in the chapter on taking cold. As regards any course of treatment for rheumatism, such as by baths, mineral waters, or the internal use of drugs, I have no especial suggestions to advance. The connection between quinsy and rheumatism is thoroughly well established from a clinical point of view; and if an individual with the quinsy habit suffers from any prominent rheumatic manifestations during the intervals or after an attack of faucial abscess, there can be no question as to the propriety of a course of internal medication. It has been my own practice in such a case to administer the salicylates for a period of from four to six weeks, in from ten to twenty grain doses, given three times daily, provided they are tolerated by the stomach. If contraindicated, trial may be made of the oil of wintergreen, salol, iodide of potash, or other antirheumatic remedies. Our main reliance, however, will be in the removal of enlarged tonsils, the correction of other local disorder in the air passages, and the proper regulation of the habits of life.

CHAPTER LIX.

HYPERTROPHY OF THE TONSILS.

As we have already learned, the faucial tonsils are composed almost entirely of that somewhat curious tissue which is especially liable in the earlier periods of life to become the seat of morbid changes, viz., the lymphatic tissue. Furthermore, when any morbid process fixes itself upon these structures, it ultimately results in the very large majority of instances in the development of a permanent hypertrophy. Probably in no masses of lymphatic tissue found in the body is hypertrophy more frequently met with than in those masses which are designated as the faucial tonsils.

Etiology.—Undoubtedly the most prominent predisposing cause of this affection lies in that peculiar diathesis which we may call the lymphatic habit, which is somewhat closely related to the strumous diathesis.

Recognizing, then, the existence of a diathetic habit as causing the disease, this necessarily involves the further statement that it is hereditary. This fact is constantly taught us by clinical experience, in that we frequently see several cases occurring in children of the same family, and furthermore learn of one or both the parents having suffered in the same way.

The disease is essentially one of child life, and develops somewhat early. Probably in many instances the commencement of the morbid change occurs during fœtal life. As a rule, however, the organs commence to enlarge at about the age of three or four. Many statistics have been published showing definitely the ages at which this disease is met with. These give little information, however, for the statistics simply show the ages at which the cases presented for observation. I am disposed to think that sex has little, if any, predisposing influence.

Among the most active causes of the disease are scarlet fever, diphtheria, measles, and small-pox, in the order of their importance.

Cornil very shrewdly suggests that these diseases, being infectious in character, naturally give rise to inflammation of the lymphatic glands in the deep-seated structures of the fauces, and thereby

set in play forces which result in permanent hypertrophies—a process which is by no means liable to follow a simple catarrhal inflammation in this region.

How large a proportion of instances of this affection follow the infectious diseases noted above I have no means of determining, but I am disposed to think that probably from one-third to one-half of all cases arise in this way.

While, therefore, we account for quite a large proportion of instances of hypertrophied tonsils by the predisposing influence of the lymphatic habit, and accept the occurrence of one of the exanthems as the immediately exciting cause, we must recognize the fact that the disease may develop insidiously, and without any apparent cause, being an essentially chronic affection from the onset.

Hamonic reports a number of cases which appeared to be due entirely to syphilitic infection. These instances all occurred in young adult life and in the earlier stage of the specific infection, usually from two to six months after the primary lesion. Hamonic takes the ground that these hypertrophies are in the nature of secondary adenopathies in which the lymphatic bodies which form the faucial tonsils assume the same relation to the syphilitic infection as do the lymphatics of the cervical and other regions.

Pathology.—In an earlier work I described for the first time, I think, two varieties of hypertrophied tonsils, viz., the hypertrophic form and the hyperplastic form, the former term being used to designate the variety of enlarged tonsils most frequently met with, namely an abnormal increase of all the normal elements which go to make up the organ; while the latter term was used to designate that form of hypertrophy ordinarily met with at a later period than early childhood, and composed very largely of connective tissue.

In the hypertrophic form we find the organ greatly increased in size, and studded as in health with from seven to twelve regularly shaped openings which mark the orifices of its crypts. It is covered by mucous membrane, which passes down into and forms a lining to the enlarged crypts. Its epithelium is unaltered. Beneath this, however, we find the papillæ flattened and more widely separated than normal, apparently as the result of the distention of the organ. Beneath the mucosa we find a submucous layer, notably augmented by the deposit of connective-tissue fibres. The crypts of the tonsil are increased in size, and usually will be found extending down to the base of the organ. They contain a certain amount of worn-out and degenerated epithelium and mucus, forming the ordinary cheesy matter which so frequently shows itself on the surface of the organ. The tissue lying between the crypts is made up mainly of lymphatic

bodies largely augmented in size, each lymphatic body being invested by an increased amount of connective tissue, while the spaces between these investing fibres are also filled in by bundles of the same material.

In the hyperplastic form, the only change which we note is that while the body of the tonsil is augmented by an increase in number and size of the lymphatic bodies, the process which involves these is somewhat limited, while the excessive morbid process expends itself in the development of the connective tissue surrounding the lymphatic bodies. To such an extent does this proliferation go on that the tonsillar crypts are practically destroyed and obliterated. In this way there is formed a large mass, made up of bundles of connective tissue containing within their meshes a certain number of lymphatic bodies. The blood-vessels are also markedly encroached upon, and the vascular supply therefore is notably diminished. The investing mucous membrane presents no abnormal appearances. We thus find a rounded, somewhat smooth-surfaced organ, presenting slight depressions on its surface, marking the locality of pre-existing crypts. It is of a pale color and largely made up of connective tissue.

In both forms of enlargement we find the lymphatic bodies in a state of true hypertrophy, and yet the process belongs essentially to the tonsils, in that we find no traces of the giant cell which characterizes a scrofulous enlargement of glands, as found elsewhere in the body.

The hypertrophy takes various forms and in some instances, probably as the result of repeated attacks of acute inflammation, we find the face of the enlarged organ firmly attached to the inner side of one or both pillars of the fauces—a condition which should always be investigated before operative procedures are undertaken, as otherwise the success of the manipulation might be hampered.

Recognizing the fact that the disease is dependent on a diathetic condition, we can easily uunderstand why, in most instances, hypertrophied tonsils occur bilaterally. The hypertrophied tonsil containing a number of deep, irregular crypts or pockets, the natural result is that considerable masses of mucus and worn-out epithelial cells collect in these pockets, which are provided with no mechanism for emptying themselves. These collections undergo fatty and cheesy degeneration, as is evidenced by the periodical discharge of grayish-white, ill-smelling masses from one or the other of the crypts.

This same lymphatic diathesis which predisposes to the development of enlarged faucial tonsils predisposes also, with equal activity probably, to the development of hypertrophy of the pharyngeal tonsil. Hence it is the rule, rather than the exception, in children certainly,

that when we meet with the disease in one region we also find it in the other.

Symptomatology.—The symptoms to which the presence of enlarged tonsils gives rise are to an extent mechanical, hampering and interfering with the proper function of the parts. If the enlargement is moderate, they give rise to no special disturbance other than a liability to recurrent attacks of acute sore throat.

The same also may be said of the hyperplastic, viz., the dense, fibrous form of tonsil hypertrophy.

The large spongy mass of the true hypertrophied tonsil, however, with its ragged exterior and largely dilated crypts, may give rise to both local and general symptoms of marked character.

The character of the voice is altered, and respiration may be slightly impeded by the mechanical encroachment of the tumors upon the fauces and oro-pharynx. Notable dyspnœa, however, does not occur.

Deglutition is liable to be interfered with to an extent dependent upon the size of the growths.

While the interference with respiration may not cause any conscious symptoms of dyspnœa, yet it does cause the nightmare so frequently observed in children. This symptom I regard as peculiarly symptomatic of enlarged tonsils. It arises from the fact that, the entrance of air to the lungs being slightly impeded during sleep, there follows a slowly but surely increasing lack of proper oxygenation of the blood, resulting in an increase of the *besoin de respirer*, until it culminates in a sense of oppression or suffocation, under the influence of which the child awakes alarmed and terrified.

Mouth-breathing, especially in young children, is apt to be the rule, and as the result the fauces become dry and an irritating cough occurs during the night. If these symptoms present during waking hours, it may be the result of the growths hanging down and impinging upon the epiglottis, or the cough may be of reflex character.

How far impairment of hearing is due to the enlargement of the faucial tonsils is a question by no means easy to determine, for an enlarged pharyngeal tonsil is a far more prolific source of middle-ear disease than of disease of the faucial tonsil. The two diseases occurring so frequently in the same individual, therefore, render it difficult to determine wherein lies the source of an existing impairment of hearing. That, however, the faucial tonsil does exercise an influence in many cases is clearly shown by the fact that the hearing improves by the removal of these glands. It is often stated that the deafness is due to the pressure of the enlarged faucial glands upon the anterior lip of the pharyngeal orifice of the Eustachian tube. I do not believe

this is a very active factor in the production of deafness. I am disposed to think that a more active factor lies in the interference with the proper functional activity of the faucial muscles which have to do with the renewal of air in the tympanic cavity, viz., the petro-salpingo-staphylinus or tensor palati muscle and the spheno-salpingo-staphylinus or levator palati.

While we occasionally find children with enlarged tonsils who enjoy apparently perfect health, I think it is the rule that the presence of these large bodies in the fauces gives rise to a more or less notable impairment of the general health. As contributing to this we must recognize the fact that the digestion and nutrition are notably interfered with by these enlarged glands, and that offensive masses of cheesy matter which accumulate in the tonsils are squeezed out and swept into the stomach in the act of deglutition and set up gastric disturbance. In addition to this, we must bear in mind that every breath of air which passes into the lungs passes over these receptacles of effete matter, and must be to an extent polluted, as proved by the sour and fetid character of the breath in a large proportion of the cases.

No discussion of hypertrophied tonsils is complete without reference to Dupuytren's famous case, in which hypertrophy of the tonsils was supposed to have given rise to the so-called pigeon-breast and other distressing conditions. Writers generally agree now that in this case the deformity and the enlarged tonsils were both dependent primarily upon the rachitic habit. That a case of enlarged tonsils ever gave rise to chest deformity can scarcely be accepted.

Diagnosis.—Any enlargement of these organs is of course easily recognized upon direct inspection. In order, however, to properly estimate the character and extent of the hypertrophy it is a matter of some importance that the fauces should be inspected while at complete rest, for, as we know, if the parts are irritated, retching occurs, the first motion of which consists in the contraction of the palato-pharyngeal muscles. In this movement the tonsils are thrown forward to such an extent that even those which are but moderately enlarged will appear as if they were in contact in the median line. It is therefore necessary that the tongue should be pressed down firmly but slowly, while at the same time it is drawn forward, the spatula being placed well back upon the dorsum.

As before stated, the enlarged organ may project prominently into the fauces, or it may lie deeply between the pillars in such a way as not to project beyond their border. It is important, then, that we should recognize the existence of a hypertrophic process, even though the enlargement has not attained large proportions, for, as we

have already learned, a very moderately enlarged tonsil, especially in an adult, may be the source of no little annoyance or even suffering. We must bear in mind also that we not infrequently find that the surface of the tonsil has formed adhesions with the pillars of the fauces in such a manner as to cover up and mask the diseased structures. The existence of these adhesions is easily elicited by the use of a bent probe. As a rule, they are not very firm, and are easily broken up. This should be done in all cases in order to accurately determine the extent of the morbid process.

I have never met with a case in which the diagnosis presented any points of difficulty. Mistakes may occur, however. Malignant disease, for instance, may develop so insidiously as to fail of recognition in its early stages. Thus Campbell reports a case in which, seven weeks before death from carcinoma of the tonsil, the organ presented no appearances which indicated other than simple hypertrophy; while a number of cases are reported as having been operated upon in Schroetter's clinic for simple enlargement, which were subsequently discovered to have been lympho-sarcoma. The only suggestion to be made here is that a unilateral enlargement of the tonsil, in adult life, should be looked upon with suspicion, and investigated with the utmost care, especially if the patient has passed middle life.

Prognosis.—Hypertrophy of the tonsils may commence in fœtal life, at any period of extra-uterine life up to the age of from twelve to fifteen, when the tendency to its development apparently ceases. I have never known a case of enlarged tonsils to develop after puberty, although there is no question that certain adventitious conditions may occasionally develop in these organs by which they become a source of irritation.

While, therefore, the prognosis toward disappearance at puberty is fully recognized, and while, moreover, the disease itself entails no special danger to life, I think we must recognize the fact that it constitutes an exceedingly serious menace to health, not only in those symptoms which belong to the disease itself, but also, and this fact I think should be especially emphasized, because these large, spongy masses in the fauces of a child involve a particular susceptibility to the infectious diseases of childhood, especially diphtheria, scarlet fever, and croup. I think, therefore, that physicians are scarcely justified in waiting for the process of nature to remove these organs by atrophy, even if it be a matter of but few years until puberty comes on, for those few years may be a period of danger to the child. Moreover, I know of no possible objection against their extirpation. I regard enlarged tonsils in the fauces as neoplasms, quite as much certainly as a fibroma or other homologous growth.

Treatment.—The prominent indication for treatment in this condition is the removal of the growth, and the main subject for discussion is as to the best means of accomplishing this end. Largely as a concession to the prejudice against cutting-operations on the part of parents, the attempt has been made to dissipate these tumors by means of absorbents, astringents, and caustics.

We all recognize the almost specific action of preparations of iodine in producing absorption of lymphatic enlargments, but I think we must also recognize the fact that this action is limited to the earlier periods of hypertrophy. Hence, while acknowledging that something may be accomplished in the very early periods of life by its use, I question whether any practical reduction is accomplished by such application in the ordinary run of cases such as present for treatment.

The usefulness of astringents, however, which are advocated much more extensively in medical literature, is in my mind open to serious question, and their action is limited simply to the reduction of the inflammatory process, exerting no influence whatever upon the hypertrophic condition.

Perhaps the best of these local astringents is glycerole of tannin, applied daily by means of a camel's-hair pencil; nitrate of silver (three to five grains to the ounce); sulphate of zinc, five to ten grains to the ounce; sulphate of copper, three grains to the ounce; or the insufflation of powdered alum are all in use.

Curiously enough, we still find many authorities advocating the use of caustics for their destruction, such as chromic acid, nitric acid, nitrate of silver, chloride of zinc, Vienna paste, and the potential cautery.

Chemical agents in destroying these glands must be used with a great deal of care, else neighboring tissues are in danger of being injured. It is at best an exceedingly slow and unsatisfactory process.

In addition to the above, injections of tincture of iodine, carbolic acid, and chloride of zinc are recommended. These measures are, I think, open to the same objection as the chemical caustics already alluded to.

Among potential cauteries are to be included the Paquelin cautery and the galvano-cautery.

At the present day, one would scarcely think of using the actual cautery. Most observers unite in recommending that in using the galvano-cautery a slender-pointed electrode be chosen, and that a number of punctures be made with this instrument in the face of the hypertrophied organ, much better results being accomplished in this manner than by superficial burning. If it becomes necessary to re-

sort to local destructive measures in the treatment of enlarged tonsils, this method undoubtedly is the one to which preference should be given. At the best, however, we must anticipate a somewhat prolonged treatment.

Tonsillotomy, I think, then, is the one measure of relief which should be advocated in all cases in which consent is obtained, unless some special reason exists contraindicating it. Excision of the tonsil may be done by the bistoury, the cold-wire snare, the galvano-cautery écraseur, or the tonsillotome.

I see no reason why the use of the bistoury is a more thoroughly surgical procedure, as is stated, than the use of the tonsillotome. Whatever measure accomplishes the desired end most successfully is the best surgery. Undoubtedly cases now and then occur, especially in adults, in which the tonsil is flat and deeply embedded between the two pillars in such a way that the tonsillotome does not reach it. In these cases the bistoury may be required, although in such cases my experience is very decidedly in favor of the cold-wire snare, and I very frequently resort to this instrument in the removal of small masses. The galvano-cautery écraseur possesses the advantage of extirpating the tonsil without hemorrhage. It is a slow procedure, however, and one which will be found exceedingly difficult, especially in children, unless an anæsthetic be given. In an adult, however, there can be no question but that this device presents certain advantages, because I believe hemorrhage in an adult to be a danger always to be anticipated in removing tonsils, and one which occurs in quite a large proportion of cases. Potter makes the very excellent suggestion, that in removing tonsils by this method the loop should not be adjusted too deeply, because, in the process of burning through, a certain amount of tissue is destroyed beyond the cut surface, which subsequently comes away in the form of slough.

After all that has been said in favor of the various devices already discussed, there is still no question in my mind that by far the best method of removing the tonsils, in the very large majority of cases, is by the tonsillotome. This consists practically of a ring-shaped knife, which is adjusted over the hypertrophied organ, and by a quick and simple mechanism enables the operator to remove the mass almost instantly. The advantage of this device is that the manipulation is practically unhampered by restlessness and struggling on the part of the child, the only requirement being that the mouth shall be kept open sufficiently long for the instrument to be adjusted over the tonsil. The operation is a comparatively simple one, and yet is one that requires a certain amount of manipulative skill. After an operator, however, has acquired this skill, it is a very rare event to meet

with a patient whose tonsils cannot be successfully excised, in spite of struggling or resistance, and that too without resort to a general anæsthetic.

To Physick is due the entire credit, I think, of having originated a device for the removal of these growths. Fahnenstock, Velpeau, Gerson, and Maisonneuve all modified it, and Mathieu has further perfected the instrument, as is shown in Fig. 104.

This instrument is not only exceedingly simple in its mechanism, but perfect in its action beyond any other device with which I am familiar.

It leaves absolutely nothing to be desired in the way of a tonsillotome, on account of the ease and facility with which it is manipu-

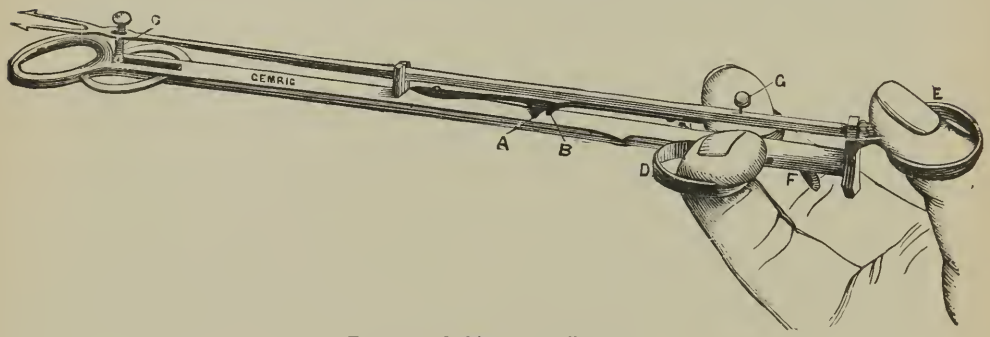

FIG. 104.—Mathieu's Tonsillotome.

lated. Especially is it valuable on account of the shape of its distal extremity, in that the slender oval ring is inserted into the mouth and fitted around the tonsil more readily and more perfectly than by any other device.

Mackenzie has modified the Physick instrument by attaching an adjustable handle to its proximal extremity, as seen in Fig. 105. In amputating a tonsil with this instrument, there is no device for securing the mass after excision. This perhaps is not a serious objection, in that it is easily expelled after the operation; but the great objection I find to Mackenzie's instrument is that the long diameter of the oval opening is antero-posterior, which is not the shape of the base of the hypertrophied gland. In the Mathieu instrument we have a small round ring attached to a slender shaft; in the Mackenzie instrument there is the broad blade, which renders it more bulky than the Mathieu instrument, and therefore of course less easily manipulated. Furthermore, an instrument held by the three fingers, as is the Mathieu tonsillotome, presents a far more convenient and easily manipulated device than one held in the full grasp of the hand.

Any one, however, who is called upon to do this operation frequently, must necessarily be provided with at least three tonsillotomes of various sizes. For many years past all my work in this direction has been accomplished by four instruments, in which the oval openings measure as follows: $\frac{3}{4}$ in. × $\frac{5}{8}$ in., $\frac{7}{8}$ in. × $\frac{3}{4}$ in., 1 in. × $\frac{7}{8}$ in., and $1\frac{1}{8}$ in. × 1 in.

In addition to this, we find in the instrument makers' stock a

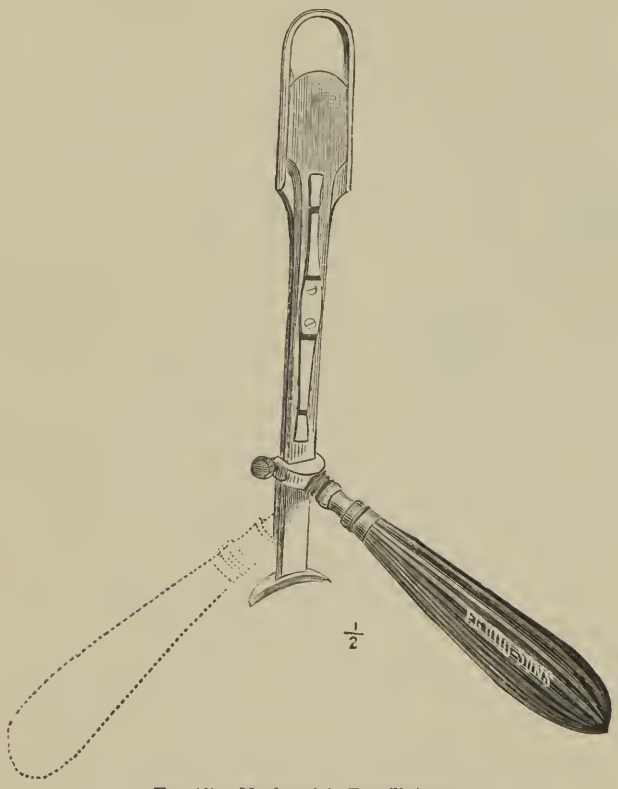

FIG. 105.—Mackenzie's Tonsillotome.

large number of devices for the removal of the tonsils. Practically, however, I think the very large majority of those engaged in special throat work confine themselves to the use of either the Mackenzie or the Mathieu instrument. As before stated, my own preference is for the latter.

In operating, the patient being in a sitting position, the tongue is easily depressed by a spatula in the left hand, while the tonsillotome, held in the right hand, is passed back into the fauces until its oval opening is directly opposite the tonsil, when it is carried

down into the sulcus between the base of the tongue and the faucial arches, the plane of the opening being an angle of about 45°. After the lower segment of the opening has passed around the lower portion of the tonsil, the instrument is then swung upward and outward until the enlarged organ projects through the opening and the ring of the tonsillotome is seen to thoroughly encircle the tonsil at its base. After the tonsillotome is in place, it is, as a rule, I think, impossible for even young children to displace it by any involuntary movements of the fauces. Hence, while the movement already described should be accomplished as rapidly as possible, the further procedures can be done with a certain amount of deliberation, in order to secure the thorough extirpation of the diseased mass. After the instrument is in place, then, the spatula may be dropped from the left hand, and the shaft of the instrument should be grasped, in such a way as to press it firmly into place, while at the same time the shaft is quickly swung up and down through the arc of a small circle of which the tonsil is the centre, thus working the ring of the instrument well down to the base of the gland, when, by a quick contraction of the fingers of the right hand, the peculiar mechanism of the instrument is brought into play and the tonsil cut through.

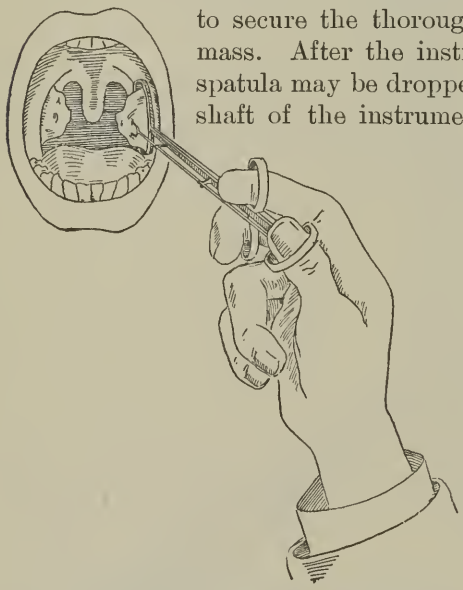

Fig. 106.—Method of using Mathieu's Tonsillotome.

As soon as this is accomplished, the patient's head is brought well forward, so that the blood which follows the cut may make its escape through the mouth rather than into the fauces.

The procedure described above is quite successful in the very large majority of instances, as after the introduction of the spatula the tongue is depressed, the mouth kept well open, and the movements of the head prevented by the firm grasp of the fingers of the left hand beneath the chin of the patient.

Of course the above procedure is accomplished with the consent of the patient. With refractory children, I have always declined to use any force other than that described in the following plan of procedure: the thumb, being enveloped in several folds of a thick towel, is inserted between the teeth of the child and forced backward be-

tween the molars, thus holding the mouth well open, while at the same time the lower jaw is grasped firmly between the thumb and the first two fingers. In this way the movements of the head are perfectly controlled. The Mathieu tonsillotome is then used to depress the tongue, while at the same time it is carried back into the fauces. When it is opposite the tonsil, it is passed down into the sulcus between it and the base of the tongue, swung on to the mass, and the operation completed in the same manner as previously described.

Passing the instrument over the lower portion of the tonsil is, I think, important, in view of the fact that in many instances the hypertrophied mass is to a certain extent pendulous, and presents a lower lobe, which hangs down, as it were, into the fauces below its attachment; hence, if the instrument were put on from above downward, it would sever but a portion of the diseased tissue; while, applied in the manner described, the whole of the mass is embraced within the ring.

A very large number of cases has come under my observation, in which the partial removal of the tonsils has given rise to but a limited amount of relief to symptoms. In my own work, I never feel thoroughly satisfied in having done an operation of tonsillotomy unless, after the removal of the organ, I see the cut surface drop back between the pillars of the fauces in such a way that these parts return to their normal position, and practically no trace is left of the pre-existing diseased organ. Of course this is not accomplished in every case, but I think it is a result to be desired.

In describing the operation, I have advised the crowding in of the tonsillotome upon the mass so as to engage as much tissue as possible. For the same purpose it is well also to make use of external pressure. I do this on the ground that with the Mathieu instrument it is absolutely impossible to engage structures which should not be removed. Neither this instrument nor any other device is capable of thoroughly extirpating the tonsils in every instance. If, therefore, any portions are found remaining after the use of the guillotine, I think they should be removed at the same sitting by means of the cold-wire snare. If both tonsils are diseased, as is the rule, I know of no reason why they should not both be extirpated at the same sitting.

After the operation, if the organ has been thoroughly extirpated, in many instances relief follows almost immediately, and the patient is conscious of no further symptoms referable to his throat, although for perhaps an hour after the operation there is a bruised and sore feeling about the parts. In other cases, there is some slight exuda-

tion on the cut surface. A white membrane forms, there is more or less inflammatory trouble, with pain in swallowing, together with febrile disturbance. This condition lasts from four days to a week, and disappears spontaneously. If the symptoms are severe, it should be treated as an ordinary croupous tonsillitis.

The operation is not especially painful, although rather terrifying to young children. I know of no objection, therefore, to removing tonsils without a general anæsthetic, provided one can gain sufficient control of the patient. It is better, moreover, that the patient should retain consciousness, and thus be enabled to expel the blood which flows after the operation. When a general anæsthetic is necessary, a few whiffs of chloroform should be given—just enough to produce slight and temporary unconsciousness.

As soon as the tonsils are out, the child is laid prone on a sofa, with the head projecting over, and the blood allowed to drip into a bowl.

If the patient fears pain cocaine may be brushed over the parts, but not injected into them.

I believe the operation of tonsillotomy is practically one unattended with danger.

As a rule, immediately following the removal of the organ there is rather free hemorrhage, which ceases, however, in the course of twenty or thirty seconds. In most instances, excessive hemorrhage comes on immediately after the operation; in other cases there is a trifling flow at the time, the secondary hemorrhage occurring some hours later.

In my own practice I have met with quite a number of cases of alarming and troublesome hemorrhage from tonsillotomy, all in adults. None of these, however, presents any points of special interest, with the exception of perhaps one. This was the case of a gentleman aged thirty-one. I removed an unusually large tonsil from the left side with the Mathieu guillotine, whereupon there followed a hemorrhage of so violent a character that any manipulation was rendered absolutely impossible. The blood poured from his throat in a stream. At the end of about three minutes syncope ensued, and the hemorrhage ceased instantly and did not recur. The amount of blood lost was from eighteen to twenty ounces. This patient was confined to his bed for a number of days, and did not fully recover his strength for several weeks.

A large number of cases of hemorrhage after tonsillotomy which I have collated establishes a number of facts which heretofore have not been sufficiently accepted. The first and most important is that every one of these cases occurred in adult life. Indeed, I know of no re-

corded instance in which dangerous or even troublesome hemorrhage followed tonsillotomy in childhood, with the single exception of one reported by Capart, in which the tonsil was excised by means of the galvano-cautery loop, in a child eight years of age, and was followed by hemorrhage, which persisted for five days. The case is unique, and the question arises whether the source of hemorrhage may not have been in an injury to the faucial pillars, the persistence of the bleeding being the result of the constant movements of the parts.

If the tonsil is one of any magnitude, its excision is an operation which is exceedingly liable to be followed by troublesome hemorrhage in probably the larger proportion of cases in adult life. Indeed, as the result of former experiences, I never undertake an operation in adult life without apprehension and without being prepared for emergencies.

A second point which I think is fairly well established by the cases reported is that, while hemorrhage may be an exceedingly troublesome accident, it is not a complication which is dangerous to life, for, although we see somewhat vague references now and then in literature to death from this cause, I know of no case reported in sufficient detail to warrant its being accepted as such.

I think also that experience shows very clearly the total inefficiency of the ordinary remedies which are classified as styptics, hæmostatics, etc.

In quite a large proportion of cases the bleeding ceased spontaneously. When the parts could be brought under easy inspection and the source of the hemorrhage traced to a spurting artery, it was successfully arrested by torsion. In the remaining cases the hemorrhage was arrested by pressure, with the exception of those in which the carotid was tied.

Our first duty, therefore, is to examine the parts carefully, in order to detect, if possible, the source of hemorrhage. If this is found to be a spurting artery, this will usually be, I think, the tonsillar artery, which, according to my experience, presents at the junction of the lower third with the upper two-thirds of the cut surface. When the source is found, an attempt should be made to arrest the bleeding by torsion. This measure failing, or the source of blood being in an oozing from the whole surface, two measures are open to us—the use of the actual cautery, or pressure. A simple method of pressure which is available in many cases consists in wrapping two or three folds of a light handkerchief about the thumb, and inserting it into the fauces, thus grasping and holding the bleeding surface between the ball of the thumb in the inside and the forefinger applied behind the ramus of the jaw. The objection to this is that it may be

nceessary to maintain the pressure for several hours before the bleeding is arrested, which is somewhat of a tax to the endurance of the surgeon. As obviating this difficulty, Clendenin has devised an instrument which accomplishes the same purpose. It consists of two long jointed arms, mounted with pads at their distal extremities, and so arranged that one pad can be adjusted to the bleeding surface, while the other is adjusted to the cervical region externally. It is fitted with a screw for regulating the pressure. Pressure by the thumb or by Clendenin's instrument is not always tolerated by the patient, on account of the retching which is excited. To overcome this a full dose of morphine may be administered hypodermically, or in an extreme case I see no objection to a few whiffs of chloroform.

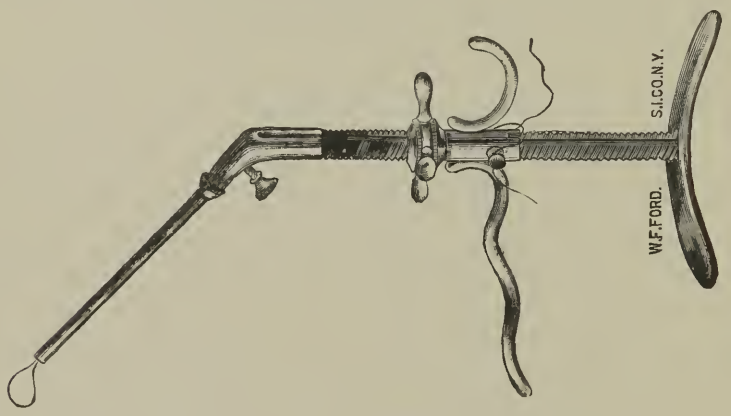

Fig. 107.—The Author's Snare for the Removal of Enlarged Tonsils.

The above measures failing to arrest the bleeding, the next resort, I think, should be to the use of the actual cautery, and the best effect is obtained from the use either of the heated irons or of the Paquelin cautery. The galvano-cautery electrode is so small that its heat is rapidly dissipated when applied to a profusely bleeding surface, and its hæmostatic powers are thus impaired. The Paquelin cautery can be maintained at the proper hæmostatic heat, viz., a dull red heat, and is not only easily regulated but affords an abundantly broad surface for burning the bleeding tissues. If the Paquelin instrument is not available, heated irons should be used. It is necessary that these should be of such size that the heat will not be rapidly dissipated by the flowing blood.

As a final resort, ligature of the carotid artery may be successful, if demanded.

While acknowledging the danger of tonsillotomy, I am of the opinion that troublesome hemorrhage can be avoided in the large ma-

jority of cases if not in all. Recognizing the fact that the operation in adult life is exceedingly liable to be followed by excessive hemorrhages if cutting instruments are used, I have for a number of years confined myself to the exclusive use of the snare when a patient has passed the age of puberty. The instrument which I use is shown in Fig. 107. It is a modification of the ordinary polypus snare which goes under the author's name, but is of much stouter construction. Its mechanism is easily appreciated by a reference to the cut. The wire to be used is No. 10 steel piano wire. In many cases the operation is finished without using the écraseur. The instrument has worked admirably in all my cases, and in no single instance has the hemorrhage been more than of the most trivial character.

CHAPTER LX.

CROUPOUS TONSILLITIS, OR ACUTE FOLLICULAR TONSILLITIS.

This affection is usually described as an acute follicular tonsillitis. In our discussion of inflammatory affections in the air passages, we have endeavored to establish a clear classification, in which the name of the disease should define, as far as possible, its pathological character. In the disease under question, we consider that the local manifestation consists of a fibrinous exudation, or, in other words, a croupous inflammation involving the lining of the crypts of the tonsil. We adopt, therefore, the name of croupous tonsillitis in preference to that of acute follicular tonsillitis, for the reason that, according to the classification adopted, the latter name properly would define a catarrhal inflammation.

Most writers describe the affection as an acute follicular tonsillitis or amygdalitis, while a few use the term infectious tonsillitis.

Etiology.—This disease was formerly regarded as a purely local affection. Latterly, however, I think all agree with the view taken in my earlier work, that it is a systemic disease or blood poison, characterized by a local manifestation in the fauces. In other words, we may, in a sense, regard it as one of the exanthemata, bearing a close relation to them in all its features, with the possible exception that it is not to be regarded as a contagious disease. This statement, of course, naturally involves the further assertion that it is to be classed as one of the germ diseases. My own view of its origin is that the germ, floating in the atmosphere, comes in contact with the ragged surface of the tonsil, and is entangled in the crypts, and from thence either makes its way into the circulation or, remaining localized at the seat of infection, gives rise there to those changes in the blood which create general febrile disturbances. At the same time a local inflammatory process of a peculiar character, viz., a croupous inflammation, is set up at the point of entrance.

What the source of the germ is, of course, can only be a subject of speculation. Clinical observation, however, teaches us that it probably is some one of the various microbes attending the processes

of decomposition in the conduits which carry off the waste matter of our houses, viz., the sewers.

While undoubtedly in most instances the infecting germ makes its way into the air passages through the air, it is altogether probable that it may be conveyed in other ways. Thus, Cotterill has recorded an epidemic which broke out in a boys' school. Its source was traced to milk from cows with diseased udders. That the contagion was carried in the milk seems to have been fairly well established, from the fact that the epidemic was arrested by boiling the milk. Carter lays a certain amount of emphasis on the atmospheric conditions as an active cause of the disease. As before stated, I regard croupous tonsillitis as a specific disease, and hold that it therefore cannot be the direct result of an exposure to cold; taking cold, and its resultant inflammatory process, must be regarded as an active predisposing cause of the disease, and nothing more.

In the same way, I think that an exceedingly important predisposing factor lies in a diseased condition of the tonsils.

It is usually considered as essentially a disease of childhood. The explanation of this is that the physical conditions of the fauces which actively predispose to the disease are met with in child life more often than at any other period, viz., an hypertrophied state of the tonsils. In addition to this, children are far more liable to attacks of catarrhal inflammation about the upper air passages, which also act as a predisposing cause of croupous inflammation. I think we must also accept the fact that the resisting power of a child being less than that of an adult, he becomes an easier victim to the invasion of a disease germ.

The question of the contagion of croupous tonsillitis is one which has been the subject of somewhat active discussion. It is by no means a difficult matter to establish the apparent fact that when the disease runs through a family, or through a neighborhood, one child has contracted it from another. These observations, however, as a rule, are deceptive. The disease usually manifests itself as an epidemic, occurring in the fall and spring months, when colds are prevalent and exposures frequent. It is far more liable, however, to run through a single family or a restricted locality than to spread through a large community. The largest prevalence which has been observed has been in institutions where a number of children are aggregated, such as schools or asylums. In most instances in which this has occurred the source has been traced to defective house sewerage. When it prevails in a community, this source is traced to unsanitary conditions involving the whole of the district affected. Therefore, while there is a possibility of contagion by absolute contact, I do not be-

lieve that, further than this, the disease is to be regarded as of a contagious character.

I have frequently observed attacks of croupous tonsillitis in the mother or attendant of a child sick with diphtheria, and I believe there is a certain indirect connection between the diseases. This, however, will be discussed in another place.

Pathology.—The essential morbid lesion which characterizes this disease consists of a croupous inflammation involving the lining of the crypts of the tonsil. These are to a certain extent distended by this deposit, which makes its appearance in the rounded, pearly white discs at their mouths. In connection with the croupous inflammation, there is usually a considerable amount of catarrhal inflammation involving the whole mass of the tonsil and extending somewhat to the mucous membranes of the faucial pillars and surrounding parts.

A microscopic examination of the exudation reveals simply a large number of fine fibrinous fibrillæ, crossed and interlaced in every direction, which embrace within their meshes leucocytes, epithelial cells, and certain extraneous matter.

The search for a specific germ in this form of tonsillitis has been made by a number of investigators. Fränkel discovered the existence of the staphylococcus pyogenes aureus and albus, while Gabbi has found the encapsulated bacillus of pneumonia.

The membrane makes its appearance somewhat suddenly and persists from three to five days, and even longer, reproducing itself after removal with quite the same activity as in the primary deposit. As a rule, it is a soft and friable exudation, breaking down easily, in which case it confines itself to the small circle immediately about the mouth of the crypt. In other instances it seems to be of a denser, more efflorescent character, and in this case its area of deposit is larger, spreading to the tissue between the lacunæ, forming a well-developed false membrane.

There is no difference between the follicular disease and what was formerly called croupous tonsillitis, except in the degree of the inflammatory activity.

The original exudation confines itself somewhat closely to the orifices of the crypt, without extending very deeply into its cavity. Moreover, commencing as a croupous inflammation, it maintains its specific character during the whole continuance of the morbid process.

Occasionally we find a suppurative process developing. This, however, is purely adventitious and bears no special relation to the croupous process.

The disease being of an acute infectious character, we should

naturally expect that the cervical glands would be involved and this as a matter of fact generally occurs. The disease usually involves both tonsils simultaneously, and this is always true if the attack is a well-marked one. It is not essentially a disease of the tonsils, because it is often found extending to the lymphatic tissues of the pharyngeal vault and oro-pharynx.

Symptomatology.—The onset is marked by very decided chilly sensations. These are immediately folowed by a general febrile movement, characterized by headache, loss of appetite, pain in the bones, and general malaise. Pain in the back is also a prominent symptom. Then succeeds a feeling of uneasiness and dryness in the fauces, but the active eruption of the follicular disease is usually postponed from twelve to twenty-four hours after the onset of the systemic disturbance. When this appears, the local symptoms in the throat assume a considerable degree of prominence, pain being the pronounced feature. While this is not constant in all cases, there is a persistent sense of fullness and discomfort about the fauces, together with a sharp, lancinating pain with every effort of deglutition.

The general febrile disturbance, at the onset of the disease, is marked by a temperature running from 102° to 104° F., and in young children is apt to be even greater; indeed, in very young subjects all the general symptoms are much more prominent, while the local symptoms are not so easily recognized. So great is this febrile disturbance in young patients that the commencement of the attack may even be marked by the occurrence of convulsive movements or well-marked eclampsia, the temperature running as high as 105° or 106°. In adult life, on the other hand, the temperature is usually from 100° F. to 102° F.

The pulse is usually full, bounding, and running from 100 to 120, according to the age of the patient.

These general symptoms continue for from twenty-four to forty-eight hours, when, as a rule, the febrile movement subsides to a notable extent, and, the disease running its course in from five to seven days, the latter period is characterized by a somewhat moderate extent of fever. The painful local symptoms, however, as a rule, continue, unless ameliorated by treatment, until the disease undergoes resolution. Occasionally there is a relapse on the fourth or fifth day.

The occurrence of albuminuria is often regarded as diagnostic evidence of the diphtheritic character of the disease. I believe it to be entirely distinct from diphtheria, and yet albumin is not infrequently found in the urine during the course of the attack, coming on usually early and disappearing with the defervescence.

Further evidence of the infectious character of the disease is thought by some to be furnished by the occurrence of the albuminuria, due, it is claimed, to the passage of bacteria through the renal tubules. The existence of an enlarged spleen during the attack, in many cases, also tends to strengthen the theory that the disorder is infectious.

Diagnosis.—Of course the interesting point in this connection always is as to the possibility of the case being diphtheritic in character, and a differential diagnosis can be established between the diseases only by the presence or absence of the Klebs-Loeffler bacillus. When brought under inspection, the tonsil is found red and swollen, while at the same time, at the mouths of the crypts of the tonsil, there will be found presenting small rounded spots or discs of a clear, bluish-white or pearly white color, smooth, and closely adherent to the mucous membrane beneath. These spots vary in size from a large pinhead to perhaps that of a split pea. If we take a small probe, with a thin pellet of cotton upon it, and attempt to remove the exudation, this will ordinarily be found easy of accomplishment. If the exudation simply fills and distends the orifice of the crypt, however, it cannot be removed without injury to the parts.

Diphtheritic exudation frequently is seen in its early stages commencing at the orifices of the crypts of the tonsils. The graver form of disease presents a thicker, more efflorescent membrane, standing out prominently upon the mucous membrane. It is of a yellow color, and closely adherent to the parts beneath. The underlying mucous membrane is of a somewhat bluish or turgid hue, in contradistinction to the bright arterial red of the mucous membrane which underlies the croupous exudation. At the end of twenty-four to thirty-six hours, the diphtheritic membrane shows evidence of the local necrosis by the yellowish-black tinge which it takes on and the sanious discharge which pours from beneath it. The croup membrane, on the other hand, remains white and healthy-looking.

Prognosis.—The disease runs its course in from four days to a week, and, while involving no special danger to life, it causes much discomfort and even suffering to the patient while the attack persists. There are certain complications, however, which, while adding perhaps no danger to the disease, increase the discomfort of the sufferer. Prominent among these is the occurrence of a suppurative tonsillitis or quinsy. This is an especial danger in those who have the quinsy or rheumatic habit. The mistake should not be made of supposing that a croupous tonsillitis may terminate in a peritonsillar abscess, for there is no direct connection between these two conditions. The local inflammatory process in the throat simply precipitates an attack of

cellulitis in those who are subject to quinsy. The occurrence of small abscesses in the tonsil from the obstruction to the mouth of the crypts has already been refered to, and does not notably complicate matters.

Albuminuria, when it occurs, is not to be regarded as a grave complication, and yet I think this is a feature of the disease which should be watched with a certain degree of care.

We do not regard cardiac disease as one of the complications which may follow an attack of croupous tonsillitis.

While paralysis of the palate is usually considered to be a complication of diphtheria, many cases have been reported in which it has followed croupous exudations. In these instances the disorder promptly disappeared under the administration of general tonics and strychnine.

In addition to the paralysis of the palate, a notable muscular weakness in the lower extremities has been occasionally noticed.

It is quite possible that a large element in the causation of these paralyses lies in the local inflammatory process, which, extending somewhat to the muscular tissue, produces a sodden condition, as it were, by which they easily become involved in a paresis. Unquestionably, however, the general blood poison is the active and efficient cause of the paralysis, the local condition simply acting as a predisposing factor.

A point of great interest in this connection is whether a croupous laryngitis or true croup ever develops as a complication of croupous tonsillitis. In my own opinion, there is no question that this may occur, although the danger is a somewhat remote one when we consider the very great frequency with which we meet with the disease in the tonsils and the exceeding great rarity with which it is followed by a deposit in the larynx. This extension to the larynx occurs in young children only, the tendency to croupous inflammation in the larynx disappearing, as we know, with the increase of years. Furthermore, I think this tendency of a croupous tonsillitis to be followed by a laryngeal complication, is increased to a certain extent by the richness or extent of the tonsillar deposit: thus, in those rare instances in which the fibrinous exudation spreads over the surface of the tonsil, forming a continuous membrane, if occurring in young children we must recognize that a serious danger exists of the same membrane making its appearance in the larynx. This occurs by a secondary and independent deposit in the parts below.

I know of no reason why a child convalescing from croupous tonsillitis may not have diphtheria, and possibly be more subject to it than when in perfect health; but that the one disease should terminate in the other is not to be regarded as among the probabilities.

Treatment.—The disorder causes considerable suffering and a certain amount of danger, both of which can be largely eliminated by a proper course of treatment.

If the bowels are constipated, a saline laxative should be administered. If the febrile movement is high, this is best controlled by the administration of antipyrin, giving five-grain doses to an adult every half-hour until five doses have been administered. For a child the dose is proportionately smaller. In this way not only is the temperature reduced, but the headache, which is oftentimes of a somewhat distressing character at the onset of the disease, is markedly relieved. If the fever or headache recur, this same drug may be again administered and in the same manner after an interval of three or four hours. In this way the prominent general symptoms will be notably relieved in the first twenty-four hours.

If the symptoms recur after this treatment, they rarely possess anything like the intensity which characterized the onset of the attack.

It may be necessary to repeat this treatment on the second day, but as a rule this will not be required. We then simply put the patient on the use of quinine in three-grain doses for an adult, given three times daily, until the attack is completely controlled.

For the amelioration of the local symptoms it has been the practice to use nitrate of silver or some of the milder astringents applied locally by means of an atomizer or brush. We can, however, more successfully combat the spread of the exudation, control the local inflammatory process, and relieve pain, by the use of the officinal tincture of iron. It is to be administered as follows:

℞ Tinct. ferri chloridi, ... ʒ ij.
Glycerini, ... ad ʒ ij.
M.

To adults this is to be given in doses of half a teaspoonful every hour, and to a child in proportion. The mixture is not a disagreeable one to take, and the glycerin gives a consistency to it by which, when taken in the mouth and swallowed, it diffuses itself about the fauces, and in this manner acts as a local application. Of course the mixture is to be taken without dilution. We not only get the local action of the iron but also the systemic effect by which the special blood condition is controlled.

As additional topical applications, either the officinal tincture or a solution of the perchloride or persulphate of iron may be used. A pledget of cotton, wrapped on a slender probe and dipped into the solution, is applied to the croupous deposits. While the destruction of the membrane is thus accomplished, I believe the relief of pain is

best obtained by the iron-and-glycerin mixture. Even after the attack subsides and the local conditions in the throat clear up, the patient is liable to be left in a condition which requires a certain amount of building up. For this purpose it is best to administer some general tonic containing barks and iron with the addition of strychnine, for perhaps a fortnight longer. Should muscular paresis occur, the only further indication is for the increased administration of strychnine.

The usefulness of chlorate of potassium is greatly overestimated. It makes an excellent cleansing wash in chronic catarrhal diseases, but I doubt if it has any effect on acute processes, of either a catarrhal or an exudative character.

Iodoform and collodion, and salicylic acid have been recommended as applications for disinfecting purposes.

The administration of sixty grains of salol in divided doses has been advocated, but though this drug undoubtedly possesses a certain potency in the treatment of quinsy, I cannot understand how it should have any notable effect upon a croupous exudation, other than controlling febrile movement. This suggests to us, however, the importance of recognizing the quinsy habit when present, and of commencing the administration of the salicylates somewhat early in the course of the treatment.

A number of observers attach a certain amount of importance to the administration of aconite, but I think that the cases are very rare in which its administration is indicated.

But one more question remains for discussion in this connection, and that is as to the necessity of isolating our cases. We have already taken the ground that the disease is epidemic and endemic, but practically not contagious. If, therefore, the diagnosis is thoroughly well established and beyond question, I see no reason for isolating a patient suffering from this disease. If, however, there be any doubt in the mind of the medical attendant, the case should be isolated until the character of the exudation is determined by bacteriological examination to be non-diphtheritic.

CHAPTER LXI.

TONSILLITHS.

Anatomically, an enlarged tonsil presents conditions more favorable perhaps for the development of a calculus than any other region of the body. That it is not met with here, however, more frequently is probably due to the fact that the parts are subject to such constant motion and pressure, in the act of deglutition, that its formation is necessarily interfered with. In this region, as elsewhere, calcareous formation takes place around some foreign body acting as a nucleus. In the case of the tonsil, this is probably found in some particle of the cheesy matter which accumulates in the dilated crypts of the diseased organ.

But one of these cases has come under my own observation. In this instance the patient was a man aged twenty-eight, from whom I removed from the left tonsil an oval mass, $1\frac{1}{8}$ inches long, $\frac{3}{4}$ of an inch wide, and $\frac{1}{2}$ an inch thick. This was embedded in the posterior portion of the left tonsil, and was easily removed by the index finger. The tonsil was notably enlarged, and the symptoms had been merely those due to the tonsillar hypertrophy.

Etiology.—As before stated, I am disposed to regard a tonsillar calculus as due to the presence of a foreign body, although the existence of a catarrhal inflammation, with the increased blood supply, may undoubtedly have its influence.

It has been thought by some that tonsillar calculus is of parasitic origin.

Robin finds a possible source of the calculi in minute calcareous crystals which the microscope shows to exist in the tonsillar glands. Schenck thinks they may be due to a gouty diathesis. No reports, so far as I know, however, have ever demonstrated the presence of urates.

Pathology.—These calculi consist mainly of the phosphate and carbonate of lime, in somewhat varying proportions, together with a small quantity of carbonate of magnesium, water, albumin, and some organic elements. A foreign body is recognized as the nucleus.

The calculus has its origin in the crypt of the tonsil, which be-

comes enormously dilated to accommodate the increasing proportions of the deposit. In the case which occurred in my own practice the deposit was probably an unusually large one. In most of the cases the concretions are reported as of the size of a nut or an olive pit, and in some even smaller, but some have measured an inch in their longest diameter.

Symptomatology.—Their presence gives rise to no prominent symptoms, other than those of an ordinary case of enlarged tonsils, and in most instances their presence is entirely unsuspected by the patient.

There are repeated attacks of sore throat, the inflammation being of a catarrhal nature. Cough is a persistent symptom in some cases. Difficulty in swallowing is a symptom which is prominent, according to the size and location of the concretion. During the intervals between the attacks, the presence of the stone may not give rise to any especial annoyance.

Diagnosis.—A tonsillar calculus is of whitish-gray color, dense in consistency, and, in a large proportion of instances, projects from the gland in such a way as to be easily recognized on the first inspection of the fauces. In other instances it is completely embedded in the tissues in such a way that the tonsil presents no appearance whatever which would suggest the existence of a chalky concretion; indeed, it has occasionally happened that the first knowledge of a calculus has been obtained in attempting the excision of the hypertrophied gland, the knife or guillotine being arrested by the hard mass in such a way as to leave the operator in a somewhat awkward predicament.

If a calculus is embedded in the tonsil and not recognized by ocular inspection, its presence is of course easily determined by palpation with the finger or an exploration of the crypt by means of a bent probe.

Prognosis.—Chalky concretions in the tonsil probably possess no tendency whatever to spontaneous absorption or disappearance. Occasionally they become loosened in the act of coughing, and are expelled spontaneously.

Their presence gives rise to no serious symptoms, and involves no special danger.

Of course it is among the possibilities that one of these concretions should become detached and drop into the air passages below, although I know of no such accident having been reported.

Treatment.—The only indication for treatment which they present is in their removal. This is ordinarily accomplished with ease. If the mass is in sight, it can be seized with a stout pair of forceps

and drawn from its bed. If the orifice of the crypt in which it is formed is smaller than the bulk of the mass, it is an exceedingly simple procedure to enlarge it by means of a bistoury.

In my own case the mass was easily enucleated by means of the index finger inserted in the fauces. In a number of the cases reported, the stone was removed during an attack of acute inflammation, which immediately subsided upon the removal of the calculus.

After the mass has been extirpated, the further indications for treatment are the removal of the hypertrophied tonsil. This, I think, should in all cases be delayed until any acute inflammatory action which may have been present has disappeared.

CHAPTER LXII.

MYCOSIS OF THE FAUCES.

This term is used as including those cases which in literature are described as mycosis tonsillaris, mycosis pharyngeus, etc., according to that portion of the fauces wherein the disease has either its primary origin or its most prolific development.

It consists of a deposit upon the surface of the mucous membrane or within the crypts of its follicles, of the spores of mycosis leptothrix, which grows into vigorous plants, whose offshoots project noticeably above the surface of the membrane, while at the same time, by a more or less rapid progress, the area from which they spring broadens until neighboring parts are involved.

Etiology.—The immediate cause of the attack is the deposit of the specific spore upon some part of the mucous membrane. Its primary source, however, is somewhat problematical.

Toeplitz, indeed, in his investigations, has isolated three different varieties of the leptothrix from the secretions in the mouth. The clinical status of the leptothrix is very clearly stated by Wagner as follows: "In every one it occurs upon the finely granular masses of decomposition within the teeth (summit of the papillæ of the tongue, sediments around the teeth, tartar), in great masses in the thick brown coating on the tongue (typhus), constant in the intestines and in the fæces, very frequent in the vagina, sometimes in the lachrymal duct." The mouth, therefore, is probably the immediate source of the spores which give rise to the fungus development in the faucial mucous membrane. Why this transfer should take place it is not easy to state.

That an acute inflammation of the membrane may favor its development seems to be quite reasonable—a fact which we frequently notice in connection with other disease germs. It is quite possible that an acid reaction of the oral secretions favors the more vigorous development of the spores. In six cases which have come under my own observation the patients were apparently in the best of health, with the exception perhaps of one case, that of a man of thirty, whose general health was somewhat impaired by overwork and nervous strain.

It usually occurs between twenty and thirty-five years of age, though no age is exempt.

Pathology.—The leptothrix belongs to the schizomycetes group of fungi, its latter term applying to all those minute vegetable organisms which are almost ubiquitous in drains, refuse-heaps, running streams, bogs, etc. They also appear in urine, milk, or other watery solutions containing organic matter on remaining exposed to the air for any length of time. The name leptothrix is given simply to that species of the schizomycetes in which the cells assume an elongated cylindrical or thread-like shape. When the spores of this plant lodge upon the mucous membrane of the fauces, these small thread-like bodies, augmenting rapidly by fission, multiply themselves, gradually building up the plant-like mass of spores which is easily recognized on gross inspection, standing out from the surface of the mucous membrane as small, pointed, wartlike projections of a clear milk-white chalky color.

When subjected to microscopic examination, it will be found that these masses are made up of a number of fully developed rod-like cells of leptothrix embedded in a mass of amorphous granules.

If treated with a weak Lugol's solution, we find that the thread-like bodies assume a distinct bluish tinge, demonstrating the presence of starch.

When the disease penetrates into the crypts of the tonsil, the alterations in the organ appear to be confined almost entirely to the superficial epithelial layer, which is thickened, and the cells lose their characteristic form, probably from pressure, and become atrophic and ill defined. The crypts become dilated and filled with the fungous growth and degenerated epithelial cells. The presence of muscular fibres has been demonstrated in a mass of the vegetation removed from one of the faucial pillars, thus showing that tissues other than the lymphatic can be penetrated by this organism.

Symptomatology.—The presence of this growth in the faucial mucous membrane seems to be tolerated with almost entire impunity, for it excites no inflammatory changes whatever in the membrane proper, the symptoms being of a purely mechanical character. As the plant increases in its area of distribution, the movements of the fauces become hampered somewhat, their flexibility lessened, and there is a feeling of stiffness in the region, especially during the act of deglutition, or in the other ordinary movements of the fauces. This is more marked, of course, in those instances in which the plant grows in the pharyngeal mucous membrane. Occasionally there is a slightly irritating cough.

It usually occurs in individuals in the enjoyment of perfect health, and its presence seems to give rise to no general disturbance.

Diagnosis.—When the plant has attained such proportions and area of distribution as to be recognizable on ocular inspection, it makes its presence known in such a way as to be almost unmistakable. It is usually found in its largest and most perfect development in the crypts of the tonsil, extending therefrom to the lateral walls of the pharynx, and to the glandular structures at the base of the tongue. Its starting-point most frequently is in the faucial tonsil. Next in frequency it has its origin at the base of the tongue in the lingual tonsil. Its occurrence or extension to the pharyngeal tonsil is somewhat rare, although it has been observed in this region. It has also been known to occur on the soft palate and uvula, and again to confine itself to the tongue.

When seen, it presents in small, somewhat pointed masses or shoots, projecting from the surface of the mucous membrane, of an opaque, milky-white color, moist in appearance, and of soft consistency.

There are few diseases with which it may be confounded, although possibly it might be mistaken for the cheesy masses which are so frequently found in the crypts of the tonsil. These latter, however, present an ordinary yellowish and somewhat fatty aspect, in distinction to the clear, milky-white color of mycosis. Furthermore, the cheesy masses are easily pressed out of the tonsil, whereas the leptothrix can only be torn away with the rupture of blood-vessels.

Acute follicular tonsillitis has something of the appearance of mycosis, and yet the evidence of local inflammatory action, together with the marked febrile disturbance which accompanies it, renders a mistake in diagnosis unnecessary.

The disease generally starts on one side, but after persisting for some time it usually develops on the opposite side of the fauces.

Mycosis cannot easily be confounded with diphtheria, as both the local appearances and the general systemic disturbance in diphtheria are so characteristic as to render such a mistake culpable, even in the early stages of either disease. Of course the microscope should in all cases render the diagnosis certain.

Prognosis.—Mycosis seems to be a very harmless disease, and one which involves no dangerous tendencies. Having established itself in a favorable locality, it may apparently persist as long as life lasts.

Treatment.—While we have intimated that the disease is purely a local one, and one which gives rise to no general disturbance, this does not militate in any way against the view that there are certain

systemic conditions which favor the development of mycosis. Certainly, when we consider the almost ubiquity of this germ, we are necessarily compelled to recognize some general condition which leads to its development in one individual, while so many others escape in whose oral secretions the leptothrix is undoubtedly present. The treatment, therefore, of the disease necessarily should be both local and general. Local measures consist of the eradication of the plant by such means as may tend to destroy the germs. There can be no question that the most favorable local condition for the development of the leptothrix lies in the spongy mass which makes up the tonsil. Hence the removal of this tissue very largely does away with the conditions favorable to its obtaining a foothold. This, I think, should undoubtedly be done in all cases when feasible.

The local indications, then, consist in, as far as possible, removing the tissue which favors its growth, while at the same time the plant itself is to be destroyed. Probably the galvano-cautery for destructive purposes, in its convenience of manipulation and in its efficiency, affords us a device which presents advantages over all others, although undoubtedly equally thorough work may be done with the milder destructives, such as chromic acid or the solid stick of nitrate of silver. I see no special good to be accomplished by the removal of the growth alone by means of forceps, without destroying the part from which it springs. In the cases which came under my own observation, the sharp curette was used, scraping away not only the mycotic growth but also the mucous membrane. This was followed by cauterization with chromic acid. The results were entirely satisfactory. In addition to the local destruction, the rubbing in of sublimate solution (1 to 2,000) will add to the probability of a successful result.

Conceding that there is a systemic condition favoring the development of these growths, it becomes our duty to correct any general dyscrasia or habit that may be discovered in the individual, carrying out indications as they present. Special attention in this connection of course should be directed to the condition of the digestive apparatus, and any errors found should be regulated. As the leptothrix is supposed to flourish when the oral secretions are acid, the free use of alkaline gargles seems to be indicated, as well as the internal use of alkalies.

At best, the disease is an exceedingly obstinate one, and requires much patience and persistence, on the part of both the patient and the physician. The local destruction is to be accomplished with great care and minuteness of detail in thoroughly eradicating

every vestige of the disease, and even then, apparently, it is not always possible to assure a patient that the cure is a radical one. Recurrence has taken place even as late as five years. This seems to emphasize still further the importance of general measures of treatment in connection with local applications.

CHAPTER LXIII.

HYPERTROPHY OF THE LINGUAL TONSIL.

That hypertrophy of the lymphatic tissue in the glosso-epiglottic fossæ might be the source of definite morbid symptoms was first suggested by Heymann in a somewhat casual reference to a case seen by him, and also a similar instance observed by Stoerk.

Etiology.—We have already discussed in the chapters on the faucial and pharyngeal tonsils the general subject of the causation of hypertrophic changes in lymphatic tissue. Practically the same general rule applies to the lymphatic tissue at the base of the tongue. In this region, however, the follicles are displayed in a broad layer, involving the floor of the two glosso-epiglottic fossæ, and do not aggregate themselves into the thick masses such as are found between the faucial pillars. For this reason, perhaps, the hypertrophic changes do not result in the development of those large spongy masses which are found between the pillars of the fauces and in the vault of the pharynx. It is, moreover, a disease essentially of adult life, the symptoms rarely if ever manifesting themselves in children, the youngest case which I have seen being that of a young lady aged eighteen.

Lymphatic changes, as we have seen, belong essentially to child life. Hence, we must conclude that, whereas the morbid process in the tissue commences in early life, the symptoms do not manifest themselves until later years.

It occurs far more frequently in females than males, thus apparently reversing the rule which obtains with reference to the faucial tonsils.

The starting-point of the trouble may lie in an attack of diphtheria, of scarlet fever, or in any of the acute infectious diseases. In most cases, however, it is probably a chronic process from the start, differing from other chronic inflammatory diseases in the fact that its course is not usually marked by recurrent attacks of acute inflammation.

Pathology.—As we have already learned, the meeting of the epiblast and the hypoblast at the isthmus of the fauces, in the devel-

opment of the fœtus, is attended with a deposit of lymphatic tissue, which seems to form a girdle, as it were, in this region, encircling the isthmus; the lymphatic tissue of the vault of the pharynx, or the pharyngeal tonsil, forming the upper portion of the girdle, the faucial tonsils forming its sides, while the circle is completed below by the similar structures found in the glosso-epiglottic fossæ. The mucous membrane of the dorsum of the tongue is quite rich in muciparous glands. In that portion, however, which extends from the papillæ circumvallatæ to the epiglottis they are so thickly distributed as to form an almost continuous layer, although they vary considerably in different persons. Each individual gland is easily recognized, standing out somewhat prominently from the mucous membrane. In the centre of each projection, the minute orifice of the duct can often be seen with the naked eye. This duct opens into a wide flask-like cavity, lined with a prolongation of the mucous membrane from the orifice. Beneath this, we come upon a layer of large, rounded blind follicles or lymphatic bodies embedded in a delicate fibrous matrix, the whole gland being inclosed in a fibrous capsule. We thus find the pouch-like cavity of each muciparous gland completely invested by lymphatic tissue, constituting an individual secreting organ, in which the bulk is very largely made up of lymph tissue, and therefore one which is especially liable to become the seat of morbid changes.

Symptomatology.—I am disposed to think that in most instances the annoying or distressing symptoms which this condition causes are present only when the hypertrophy is sufficient to more or less completely fill the glosso-epiglottic fossæ and impinge upon the crest of the epiglottis. When this occurs, there is a sense of fulness in the throat, with tickling and irritation, under the influence of which the patient constantly endeavors to clear the throat. A dry, irritating, hacking cough is present in a majority of instances, attended with no expectoration, as a rule. Hoarseness or loss of voice, if such be present, is the result of independent causes, and not of an enlarged lingual tonsil, although the voice is weakened and tires easily. Indeed, the singing voice may be completely destroyed, without any apparent abnormal condition in the laryngeal cavity. A feeling of uncertainty, or lack of confidence in the voice, is especially noticeable with singers suffering from this condition.

A patient is rarely able to nicely locate his symptoms, and yet occasionally he complains of the sensation of a foreign body impacted directly at the base of the tongue. In a few cases, the hypertrophy has attained such unusual proportions as to imprison the epiglottis.

The whole train of symptoms is somewhat dependent upon the

general habit, and is especially liable to be the source of annoyance in those patients in whom the nervous temperament is predominant. This, of course, explains the greater frequency with which the disease comes under our notice in females. As a rule, the symptoms are somewhat persistent and are notably aggravated with impairment of the general health, weariness, overwork, or any condition which taxes the nervous system.

As a rule, I think we shall find that the most constant and characteristic symptoms of the condition are the irritation and tickling in the throat, with the persistent and annoying cough, while other manifestations are somewhat irregular and inconstant.

Diagnosis.—It is not always an easy matter in any given case with symptoms referable to the throat to determine definitely where the source of the trouble lies. No examination of such a case is complete without an exploration of the whole of the upper air tract from the anterior nares to the trachea. Our knowledge of diseased conditions of the lymphatic tissue at the base of the tongue is of such recent date that it can scarcely be considered superfluous to say that no examination of the upper air tract is complete which does not take into account the possibility of an hypertrophied lingual tonsil as the cause of faucial irritation, a throat cough, or impairment of the voice.

Fig. 108.—Enlarged Lingual Tonsil as Seen in the Laryngoscopic Mirror.

The examination is necessarily made by means of the laryngeal mirror, which will reveal the glosso-epiglottic fossæ more or less completely filled with a mammillated, somewhat cone-shaped mass, of a pale pinkish color, and separated in the median line by a sulcus, which marks the site of the central ligament. The crest of the epiglottis will be seen raised upon, and in some cases apparently embedded in, the apex of the hypertrophied mass (see Fig. 108). I think it is well to make the examination, not only with the tongue protruded, but with the tongue *in situ*, as in the latter position the amount of impingement upon the epiglottis is more clearly estimated.

I know of no method of determining with absolute certainty that the lingual tonsil is the source of the symptoms, and yet I have frequently observed that, when the tongue is drawn forward in such a way as to separate the hypertrophied tissue from the crest of the

epiglottis, a sense of relief from faucial irritation is experienced by the patient.

A somewhat ingenious diagnostic is made by Seifert, who, after locating sensitive points, made an application of cocaine, producing anæsthesia, thus for the time giving entire relief to symptoms.

Prognosis.—The condition is not a grave one, and involves no special danger to the general health, nor to the integrity of the air passages below.

Treatment.—The indications for treatment are the same as in the faucial or pharyngeal tonsil, and consist in the ablation of the diseased tissue. In my own experience this cannot be accomplished by local applications, although undoubtedly marked temporary relief can be afforded by nitrate of silver, tincture of iodine, chromic acid, or any active astringent. The question arises, then, as to the best method of destruction or ablation. The galvano-cautery answers an efficient purpose undoubtedly in the smaller growths, but, when the mass is large, a number of applications will be required. My own experience with the galvano-cautery has been such as to lead me to abandon its use in these troubles.

A serious objection to cutting instruments in this region lies in the fact that we not infrequently find a number of large veins distributed about these growths, the cutting of which may result in troublesome if not serious hemorrhage. I think, therefore, that we should resort to the potential or chemical caustic and cutting instruments with hesitation. I have found, in my own experience, that the cold-wire snare is not only more easily manipulated and more efficient than any of the devices above referred to, but that its use is attended with but trifling hemorrhage. The instrument that I prefer is the nasal polypus snare known under my name, the tube of which, being of flexible metal, can easily be bent to the proper curve, viz., to about the sixth of a circle.

Before operating, a twenty-per-cent solution of cocaine should be applied, and, although this does not completely anæsthetize, it notably diminishes the pain. This can be applied by the probe or by the laryngeal spray.

In operating, the patient is directed to hold the tongue well protruded between the thumb and forefinger in the usual manner. The snare being held in the right hand, the loop is adjusted over as much of the growth as is feasible with the aid of the laryngeal mirror, held in the left hand, and the mass severed. This procedure is to be repeated until the whole mass is extirpated.

The removal of the growth, of course, is followed by a complete disappearance of symptoms, although the patient may have more or

less pain for several days following. For the first day or two after the operation the food should be of bland and unirritating quality. A certain amount of relief can be afforded by directing the use of gum arabic, marshmallow, or the lactucarium lozenges sold in the drug stores under the name of the Pâte Aubergier. This last, by the way, is an excellent remedy for the relief of the cough and throat irritation in those cases in which operative interference is declined. If the cough is severe, and does not yield readily to other remedies, a lozenge containing a small amount of codeine or opium may be administered. In this connection, mention should be made of the varicose condition of the veins at the base of the tongue, the symptoms of which, to a certain extent, resemble the enlargement of the lingual tonsil. An examination with the laryngeal mirror easily reveals the large blue veins coursing through the tissues at the base of the tongue. The indication for treatment of this affection is in the use of the actual or chemical cautery.

CHAPTER LXIV.

DIPHTHERIA.

Diphtheria is an acute infectious disease with constitutional and local symptoms, due to the influence of a specific germ, the Klebs-Loeffler bacillus, which is found in great numbers in and about the characteristic pseudo-membrane covering the area of local inflammation.

The Duality of Croup and Diphtheria.—One of the first problems which presents itself for discussion is the question as to the relation which exists between croup and diphtheria.

In a large proportion of cases of diphtheria, death results from suffocation due to the formation of a false membrane in the larynx or air passages below. Now, while the faucial exudation conforms anatomically to Virchow's original description of a diphtheritic membrane, the exudation in the larynx and trachea assumes more the form which he describes as croupous. On the other hand, cases are observed in which a croupous membrane forms in the larynx without any evidence of a diphtheritic process, and without the occurrence of a diphtheritic inflammation in the fauces. Those who advocate the duality of these diseases claim that the latter group of cases constitutes an entirely independent disease, viz., a croupous laryngitis, which bears no relation whatever to diphtheria.

From a pathological point of view, it is certainly difficult to establish the duality theory, basing our judgment entirely on Virchow's original teaching as to the differences between these two forms of inflammation, as they often merge into one another in such a way that it is impossible to establish any dividing line. At the present time, however, the diagnosis seems to depend upon the presence or absence of the specific germ of diphtheria.

In the laryngeal complication of diphtheria, we find the membrane in the larynx permeated by the Klebs-Loeffler bacillus which is absent in the ordinary form of laryngeal croup. In eighty per cent, however, of the cases of membranous croup reported to the Board of Health of the City of New York in 1894, the Loeffler bacillus was found by simply swabbing the posterior wall of the pharynx.

Aside from this pathological distinction there is practically no marked difference, either in the course or prognosis, between the two forms of the disease.

It is perhaps not an easy matter to explain why in a case of diphtheria the inflammatory process in the fauces should be diphtheritic in character, while the morbid changes in the larynx and parts below should assume the croupous type, other than to suggest, perhaps, that the mucous membranes of the larynx and trachea, for some anatomical reason, do not favor the development of a diphtheritic process. The fact, however, seems clearly established that the bacillus of diphtheria does set up two different pathological processes respectively in the fauces and in the parts below. So far as we understand these processes, however, it is a difference of degree rather than of character, the croupous deposit being practically a stage in the development of a diphtheritic inflammation. Again, we have this croupous membrane developing in the larynx, unattended by a diphtheritic process; this would seem to establish the fact that croupous laryngitis exists as a disease distinct from true diphtheria, both from a pathological and from a clinical point of view.

Etiology.—An attack of diphtheria is undoubtedly the direct result of the lodgement upon the mucous membrane of the specific bacillus, or the Klebs-Loeffler bacillus, where, finding a favorable nidus for its development and propagation, it sets up an inflammatory process at the point of arrest, which assumes the diphtheritic type. Pathologists unite in the view that this microbe does not make its way into the circulation. The systemic infection, therefore, is necessarily accounted for by the theory that the pathological process in the mucous membrane of the fauces gives rise to a toxin, and that the constitutional symptoms of the disease are due to the presence of this product in the blood.

Predisposing Causes.—The disease is essentially one of childhood, by far the largest number of cases occurring under the age of ten. Those influences which predispose to the development of catarrhal diseases have an undoubted effect upon the prevalence of diphtheria, for, while it prevails in all climates and in all seasons of the year, it is far more frequently observed in the colder portion of the temperate regions, its frequency diminishing as we approach a tropical climate. Moreover, a larger number of cases are met with during the damp and cold months of spring and fall. A mucous membrane in a state of active acute inflammation affords a far more favorable lodgement for the development and propagation of a disease germ than does the same membrane in a state of health. A very important factor of the increased prevalence of diphtheria during the damp and cold months

undoubtedly lies in the fact that our houses are much more tightly closed, and infectious germs are retained in the sleeping and living rooms of children. In the same manner defective hygienic surroundings or conditions which weaken or impair the general health and lessen the resisting power of the system undoubtedly predispose somewhat to an attack of the disease.

Perhaps a still more active predisposing cause than acute inflammation is the existence of enlarged faucial tonsils, and, in a less degree, enlarged pharyngeal tonsils. The danger to which a child with enlarged faucial glands is subjected cannot be overestimated, in that these large ragged masses of lymphatic tissue lying in the fauces afford a most favorable site for the lodgement of disease germs, which make their primary entrance into the system in the current of inspired air.

Methods of Dissemination.—Diphtheria occurs endemically, epidemically, and sporadically. The primary origin of the germ causing this disease is a matter of speculation. The localities favorable for its generation, however, are cesspools, privy vaults, and the sewers of great cities, and all places which are permeated by a foul atmosphere, dampness, and especially such as are shut off from sunlight.

We find diphtheria prevailing in epidemic form and with great virulence in rural districts and those far removed from the elaborate sewerage systems of large cities. In these instances the origin of the infection may be found in some local causes, such as neglected privy vaults or cesspools, or it may be conveyed over long distances from larger communities in which a more favorable condition for its development exists.

It is a well-recognized fact that stagnant filth or decaying animal or vegetable matter in any locality may be the origin of the contagion. The germ having been in this manner primarily developed, however, it assumes such a form and possesses such a persistent vitality that it may be transported through long distances, by railways or other methods of land transportation, in baggage, in clothing, in letters, or may be carried by the current of air in the prevailing winds. It must be borne in mind, however, that in this wide dissemination the chances of its reaching a favorable nidus are immensely diminished. That the germ may be conveyed in drinking-water without impairment of vitality is clearly shown by reported cases. In the same manner the occurrence of cases of diphtheria in a large number of families obtaining their milk from the same vender shows clearly that the germ may be transmitted in this way.

Cows, dogs, pigs, cats, sheep, pigeons, chickens, and other of the

lower animals are not infrequently attacked by diphtheria, and hence may be a source of contagion.

An additional and most important source of the disease is found in individuals suffering from it. The throat of a child suffering from diphtheria becomes for the time a very prolific culture ground for the propagation of the specific germ which is the cause of the disease. The principal means by which the virus leaves the patient is the discharges from the nose and throat, the germs in this way escaping into the atmosphere or becoming entangled in articles of clothing, bedding, and furniture. Moreover, the danger of spreading contagion persists after convalescence has begun, as cultures often demonstrate the presence of the Klebs-Loeffler bacillus in the throats of the patients after all other evidence of the disease has disappeared.

Pathology.—*The bacillus.*

Since 1868, when Buhl first announced the bacterial origin of diphtheria, all observers have confirmed this view. It remained for Klebs in 1883 to definitely isolate the specific germ, and for Loeffler in 1884 to confirm Klebs' observation by culture experiments, thus demonstrating that the disease is due to the active presence of the micro-organism now generally designated as the Klebs-Loeffler bacillus.

The bacilli occur singly, in pairs, and occasionally in chains of three or four. The germ is about the same length as the tubercle bacillus and twice as thick. The rods are straight or slightly curved, and may have club-shaped ends, or they may be pointed at the ends and swollen in the middle portion. They differ greatly in their size and shape, even in the same culture. Streptococci and other cocci are usually found associated with the micro-organism of diphtheria.

Roux and Yersin isolated the toxin of the Klebs-Loeffler bacillus in 1888–89, and showed that this product was capable of giving rise to lesions identical with those resulting from injections of pure cultures of the bacillus itself.

The Diphtheritic Process in the Fauces.—I am disposed to regard diphtheria as primarily a local disease. The specific germ, lodging upon the mucous membrane, reproduces itself more or less rapidly and penetrates the epithelium, setting up an active inflammatory process in the membrane, characterized by dilatation of blood-vessels, transudation of serum, and the escape of leucocytes. There is active proliferation of epithelial cells coincident with the escape of fibrin, which latter upon exposure to the air undergoes coagulation, forming a false membrane. The fibrin as it coagulates engages in its meshes large numbers of the newly developed epithelial cells and of the specific micro-organisms. As the direct result of this excessive

activity, together with the contraction of the fibrinous bands, tissue necrosis sets in; the vitality of the false membrane, as well as the larger portion of the mucous membrane proper, is destroyed by pressure; the necrotic tissue accordingly separates itself from the parts beneath and is thrown off in the form of a slough, and a new false membrane takes its place, or resolution may occur. In the large majority of instances the deposit occurs primarily upon the tonsils, and subsequently the pseudo-membrane extends to the faucial arch and the soft palate, and backward to the pharynx. In rare instances it extends into the nasal cavity proper. The tendency, however, is to the larynx, trachea, and bronchi.

Changes in the Viscera.—As a rule the changes which are met with in the visceral organs are such as may occur in any of the continued fevers. The mucous membrane of the bronchial tubes usually shows notable hyperæmia throughout its whole extent, while local extravasations are by no means uncommon. Among the complicating lesions are œdema and broncho-pneumonia. The heart cavities may contain coagula and the muscular structures show degenerative changes. The kidneys in most of the fatal cases are notably enlarged and show evidences of local extravasations, while the tubules are the seat of inflammatory changes. The liver and spleen in a certain proportion of cases are engorged, while the latter organ may be soft and friable. In addition to the above visceral changes, minute extravasations are occasionally found in the meninges and superficial portions of the brain and spinal cord.

Symptomatology.—The stage of incubation of the disease varies from two to eight days, according to the virulence of the contagion.

Diphtheria may assume an exceedingly mild form, or be of an unusually malignant type, according to the extent of the local inflammatory process or the degree of blood poisoning that may exist. This may depend to a certain extent on the character of the prevailing epidemic. It is an observable fact that the severity of the disease is much lessened during the later period of the epidemic invasion.

For convenience of consideration, we divide the forms that the disease may assume into three: the mild form, the typical form, and the malignant type. In addition to the above three classes, there is the pseudo or false diphtheria, a condition which often closely simulates the true form of the disease. They differ, however, in that the Klebs-Loeffler bacilli are absent in pseudo-diphtheria, this disorder apparently being characterized by the presence of streptococci and other cocci in the exudation. They differ also in the fact that the mortality in pseudo-diphtheria is very low.

The Mild Form.—This variety of the disease is characterized by

the development of a typical diphtheritic membrane in the fauces, with a certain amount of febrile disturbance, indicating the presence of the toxin in the circulation, and yet the membrane shows no disposition to extend beyond the tonsils, and the cases usually recover.

The first symptom consists of chilly sensations, followed by general febrile disturbance, the thermometer showing an axillary temperature of from 100° to 101° F. The skin is flushed, pulse quickened; there are loss of appetite, pains in the bones, and the other indications of febrile movement. This is followed soon by a sense of uneasiness and stiffness about the throat with external tenderness, due to the enlargement of the cervical glands, together with pain in swallowing.

During the first day there may be observed on the tonsils either a thin, bluish-white pellicle covering the whole surface or a number of small spots of the same color, which stand out somewhat above the surface of the mucous membrane, which is swollen and injected and presents the ordinary appearance of catarrhal inflammation, which involves the tonsils, the soft palate, and perhaps the wall of the lower pharynx. This hyperæmia is of a somewhat darker color than that which characterizes an acute inflammation. If the exudative process is confined to one side of the throat, this hyperæmic condition may also be unilateral.

At the end of the first day or the beginning of the second, if the exudation has commenced in separate points on the surface of the tonsil, these will have extended so far as to completely cover this organ with a continuous membrane, which now takes on more of a yellowish aspect and becomes entirely opaque. Its surface presents a soft, velvety appearance, and it stands out more prominently from the parts beneath, showing notable thickness on inspection.

In the course of the second or perhaps on the third day a mucopurulent secretion, moderate in amount, makes its appearance on the surface and about the edges of the false membrane, which now becomes somewhat raised, and shows a manifest disposition to separate itself from the parts beneath, presenting a ragged aspect. By the end of the third day, or even sooner, the membrane gradually turns to a bluish-brown color, indicating that the necrotic process has been completed, preparatory to the complete separation of the membrane from the parts beneath and its expulsion. This does not always occur *en masse*, as frequently it comes away in small particles or shreds, and gradually becomes thinner, until the reddened mucous surface is seen beneath.

The febrile disturbance, which was characteristic of the first two days of the attack, subsides notably toward the end of the second or

the beginning of the third day, and by the fourth or fifth day usually has almost completely disappeared.

The whole course of an attack of this sort is usually completed in from ten to twelve days, the exudation disappearing and the parts beneath assuming a healthy aspect. If any forcible attempt is made to remove the membrane at the onset, it may re-form promptly, although if left entirely alone it shows but a limited disposition to reproduce itself after the natural process of exfoliation.

The mild cases are quite as contagious as the graver varieties, and are often followed by the paretic and other *sequelæ*.

The Typical Form.—Under this head we describe that form of diphtheria in which the extension of the membrane into the larynx and trachea becomes the grave feature of the attack.

The onset of the disease is marked by either chilly sensations or a well-developed chill. If there are prodromic symptoms, they consist simply in a feeling of general *malaise*, with restlessness and loss of appetite. In young children, vomiting and even convulsions not infrequently occur. The systemic invasion is shown by general febrile disturbance, flushed skin, headache, and pains in the bones, together with scanty and high-colored urine. The patient is apt to be dull, depressed, listless, and somewhat unobservant.

The temperature is usually not much above 101° or 102° F. The pulse, while notably accelerated, is apt to be somewhat feeble and thready even at the onset of the disease.

The throat symptoms develop almost coincidently with the febrile movement, the patient complaining of a sense of dryness and stiffness about the parts, with external tenderness and pain on swallowing, the lymphatics of the cervical region being invaded by the specific virus, usually within the first twenty-four hours.

The exudation may commence as a thin pellicle, covering one or both tonsils, or it may commence in minute bluish-white spots, which at the end of a comparatively few hours have taken on a yellowish color. This discoloration may occur even before these points have spread so far as to produce a continuous exudation covering the organ. Within the first twenty-four hours the tonsillar membrane is completed, and presents a bright yellow, efflorescent, thick, velvety membrane, covering one or both tonsils and standing out prominently above the mucous membrane beneath. This is highly injected and swollen, and presents all the evidences of acute catarrhal inflammation, except that the hyperæmia is of the venous type, as evidenced by the dark-red color with a slightly bluish tinge. This discoloration extends somewhat to the soft palate, uvula, and pharynx.

On the second day, or at the latest by the third, a muco-purulent

discharge sets in, and the membrane shows evidences of a necrotic process. The membrane also shows a disposition to extend itself, spreading up toward the soft palate and uvula, and also into the pharynx. If in the former direction the palate becomes swollen, while the uvula may become œdematous, being swollen to several times its normal contour. As the necrotic process develops in the exudation, the parts are constantly bathed with the muco-purulent discharge. This is dried up by the current of air in respiration, and thus adhering closely, forms an additional source of annoyance to the sufferer. The tongue, which at the onset is moist and slightly coated, now becomes dry and covered with a brownish, ill-looking fur. The breath becomes fetid, both from the local necrosis and from the retained secretions. The temperature by the third day generally goes down from one to two degrees.

Up to the end of the third day, as a rule, the gravest symptoms which develop in the patient are those due to the blood-poisoning which results from the septic absorption, together with the interference with proper nutrition which the morbid process in the fauces entails. The most serious aspect which the disease presents at this time lies in the danger of the false membrane developing in the larynx. This usually occurs at the end of the second or during the third day. In rare instances it is postponed until the fifth. The occurrence of this complication is first shown by the hoarseness or complete loss of voice which results from it. This is soon followed by dyspnœa, characterized by obstruction both to inspiration and expiration, although of course, in the nature of the case, the expiratory effort is accomplished with much more ease than inspiration. The development of dyspnœa is recognized by the ordinary symptoms characteristic of laryngeal obstruction, such as subclavicular and abdominal depression, cyanosis, etc. The laryngeal stenosis is mainly the result of the false membrane, although undoubtedly a certain amount of paresis in the respiratory muscles of the larynx contributes no little to the symptoms. The occurrence of a deposit in the larynx is also evidenced by a recurrence of febrile movement.

If life is prolonged for a sufficient time, the exudation may separate itself on the third or fourth day and be expelled, either in part or in a complete cast of the larynx and trachea. This is followed either by resolution or by reproduction of the membrane. If the faucial exudation is progressing favorably at the time the tracheal membrane is expelled, there is less probability of a re-formation in the parts below than if the diphtheritic process above is in a state of activity. Ordinarily, we may say that the development and exfoliation of a diphtheritic membrane is a process extending through from

five to seven days, and the clinical history of an ordinary case of this form of diphtheria which progresses favorably, and in which suffocation does not occur as the result of the tracheal exudation, covers a period of two weeks or longer.

The Malignant Form.—We apply the term malignant to that form of diphtheria in which the prominent symptoms are dependent upon the profundity of the blood poison. The prodromic symptoms are usually absent. The onset of the attack is generally marked by a fully developed chill or notable chilly sensations. Vomiting not infrequently occurs, and may persist for some time after it commences. Convulsions also are occasionally met with. The morbid process in the fauces differs in no marked degree from that of an ordinary attack of diphtheria. The febrile disturbance, which at first may be marked by a temperature of 101° or even 102°, usually disappears during the second day, and the further course of the disease is marked by a low temperature, or there may even be a total absence of febrile movement.

The patient seems to be overcome at the onset of the disease by the exceeding virulence and activity of the morbid material which enters the circulation. This is evidenced by the peculiar bluish-gray aspect of the skin, the dull eye, the listless, apathetic condition of the patient, the failure to notice individuals or occurrences in the room. The pulse is rapid, feeble, and irregular; the urine is scanty and high colored, or it may be suppressed; the administration of food and drink is accomplished with considerable difficulty, not on account of any dysphagia or pain in deglutition, but rather from the general apathetic condition of the patient. The impression produced on the nerve centres by the toxins is evidenced in many instances by the occurrence of eclampsic symptoms or delirium, which is usually of the low, muttering type. Another nervous symptom of some import, and which is to be explained in the same way, is the absence of tendon reflex.

If the patient survives to the third or fourth day, the local morbid process in the fauces may extend to the parts below and develop laryngeal stenosis; as a rule, however, a fatal issue ensues before the dyspnœic symptoms have developed sufficiently to contribute notably to the fatal termination. In other words, the disease seems to expend itself in the development of the toxæmia rather than the formation of membrane.

Diagnosis.—A diphtheritic membrane primarily makes its appearance, in the very large majority of cases, on the face of the faucial tonsils. In rarer instances it begins on the pharyngeal tonsil. When the membrane commences in the naso-pharynx it very soon

extends to the level of or below the soft palate, in such as a way as to bring it into direct view.

In the differential diagnosis between croupous and diphtheritic inflammation, emphasis is laid on the following points: A croupous membrane is thin, of a bluish-white color, with a shining, glazed surface, and is separable from the parts beneath; a diphtheritic membrane is thick, of a yellowish color, soft and velvety surface, and is closely adherent to the parts beneath.

After the second day of a diphtheritic process, when tissue necrosis occurs, it assumes a bluish-black aspect, with ragged edges, and is attended with a more or less profuse muco-purulent secretion. The necrotic process, furthermore, is evidenced by the characteristic fetor. A croupous membrane remains croupous until the end, when it is exfoliated, either in a mass or in small particles. It is cleanly in aspect, healthy in color, and never attended with a muco-purulent secretion. On rare occasions we may meet with instances of fibrinous exudation which possess the characteristics of both processes or membranes which are on the dividing line between croup and diphtheria.

Something, perhaps, can be learned from the tendency of the membrane to spread throughout the fauces. In a follicular tonsillitis the exudation confines itself, as a rule, to the mouths of the crypts. Occasionally it spreads over the tonsil, still retaining its croupous character. In the milder form of diphtheria we meet with cases in which the original deposit is limited to the face of the tonsil; in these instances, however, the exudation presents the typical character of the diphtheritic process above described. Any membrane which, commencing on the tonsils, extends to the soft palate and uvula, is probably of a diphtheritic character.

In pseudo-diphtheria, however, the membrane and general symptoms often resemble the condition found in true diphtheria to such a degree that it is impossible to give a definite diagnosis without the aid of the bacteriologist. According to our present knowledge, the absence or presence of the Klebs-Loeffler bacillus will decide the diagnosis in all doubtful cases.

It has been claimed that the disease may occur primarily in the larynx or the nose, and subsequently extend to the fauces. I believe that the lymphatic tissue of the faucial and pharyngeal tonsils presents the most favorable nidus for the lodgement of the diphtheritic germ; and I regard this rule as so universal that I am disposed to think the primary origin in all cases of diphtheria is to be traced to the occurrence of a deposit on one of these three lymphoid masses.

Prognosis.—Certain complications or *sequelæ* which may precipi-

tate a fatal issue, are common to both the mild and severe cases of diphtheria. As a rule, however, they are more apt to occur in the graver variety of the disease. The most prominent of these are referable to the heart, kidneys, and lungs, and are probably due to the more or less profound toxæmia which exists in diphtheria.

The cardiac disturbance may consist of a rapid, feeble pulse throughout and after the attack, or a pulse which becomes progressively feebler and slower until it may reach as low as forty or thirty beats a minute, or there may be a sudden failure of the heart, which may occur either during the attack or during resolution.

Albuminuria, present in a majority of cases of the disease, may in rare instances constitute a grave complication. As a rule, however, the renal changes are but temporary in character and rarely of serious import.

Bronchitis and pneumonia are complications which prove fatal in a large number of cases.

In laryngo-tracheal diphtheria, while a notable extent of blood-poisoning is shown by the constitutional symptoms which develop, the tendency to death is in the main due to the development of the membrane in the larynx, with its resultant asphyxia. Woronichin, in an analysis of 445 cases of diphtheria observed in the Elizabeth Hospital for Children at St. Petersburg, during a period of nineteen years, shows that 63 had laryngo-tracheal diphtheria, while 103 were affected with the malignant type. Of those affected by the laryngo-tracheal form 55 died, the death-rate being 88 per cent. In these cases it is seen that the laryngo-tracheal form of the disease occurred in about 15 per cent.

This differs notably from the statistics of Lunin, who, in a total of 296 cases observed, met with 95 instances of laryngeal invasion, or something over 32 per cent. The total death rate in Woronichin's cases was 55 per cent. In Lunin's it was about 56. That this is not an excessive hospital mortality is shown by the fact that of 606 cases of the disease treated in the Hôpital Trousseau in Paris for 1883, 391 died, a death-rate of 64.5 per cent, while of 319 cases treated in the Charité at Berlin in 1885, 208 died, a death-rate of 65.5 per cent. The striking difference between the fatality of the disease as occurring in hospitals and at home is shown by the returns of the New York Board of Health. For eight years, extending from 1880 to 1887, the death-rate was but 42.62 per cent. The highest death rate, occurring in 1884, was 49.47, while the lowest was in 1883, being 34.37. In Boston during the same period the death rate in each year varied from 26.44 to 35.07, the average being 30.88 per cent, the lessened mortality there being undoubtedly due to the fact that the poorer

classes are not crowded together in large tenement houses to anything like the extent that prevails in New York.

The prognosis in the malignant form of the disease is very grave. Thus, in Woronichin's cases it was 92.50 per cent, while in Lunin's it was 84 per cent.

The larynx is often invaded in the malignant form of the disease; but most frequently the septic infection is of such a violent type that the patient is overwhelmed by it at the onset of the disease, and succumbs before the laryngeal invasion has developed to a sufficient extent to produce suffocative symptoms. Age is always to be regarded as an excedingly important factor in forming a prognosis. In Woronichin's cases, the general mortality being 55 per cent, below the age of four it was 68.6; below the age of eight, 51.8; and above the age of 8, but 20 per cent.

Since the introduction of antitoxin, however, the consensus of opinion is strongly in favor of the view that the rate of mortality in diphtheria has been more or less reduced. Though statistics are not always to be relied upon on account of the many and variable conditions upon which they depend, nevertheless, the difference in the rate of mortaility before and during the employment of antitoxin seems so marked that we are convinced of the efficacy of the remedy.

Welch has collected the reports of 7,166 cases of diphtheria treated with antitoxin, the bulk of which came from children's hospitals. Of these only 17.3 per cent died. In 46 of the reports in his table the percentage of deaths from diphtheria previous to the employment of antitoxin is given for the same hospital or locality in which the serum treatment was afterward adopted. The number of cases treated with the serum amounted to 5,406 with 1,008 deaths, or 18.6 per cent. If, however, the number of deaths were calculated according to the percentages of the previous mortality given in the table, there would have been 2,279 deaths or 42.1 per cent. According to these estimates, therefore, there was an apparent reduction in the number of deaths of 55.8 per cent from the use of antitoxin. During the same period in which Roux treated with the serum 300 cases in the Hôpital des Enfants Malades with a fatality of 26 per cent, the fatality in the Hôpital Trousseau, also in Paris and receiving a similar class of cases, was 60 per cent, antitoxin not being employed at the latter place. Baginsky claims that, in unselected cases, he treated 525 cases of diphtheria with antitoxin with a fatality of 15.6 per cent. During a period of forced interruption of this treatment on account of failure in the supply of the serum, 126 children were treated without antitoxin with a fatality of 48.4 per cent. Welch has also collected the reports, chiefly from hospitals, of 640 tracheotomies with a

fatality of 39.8 per cent, 342 cases of intubation with a fatality of 28.9 per cent, and 26 intubations followed by tracheotomy with a fatality of 53.8 per cent. All these cases were treated with antitoxin. If, however, the same mortality had followed the administration of the serum in these cases as had occurred previous to its use, according to the reports of most of the same hospitals and localities, the percentage of deaths would have been 64.5 per cent after tracheotomy, and 62.5 per cent after intubation.

At the eighth annual meeting of the American Pediatric Society, held May 26, 1896, a report was given of a collective investigation into the use of antitoxin, which is especially valuable because it is confined to the results of treatment obtained outside of hospitals. The report includes 3,384 cases collected from the records of 613 physicians. It also includes 942 cases from the reports of the New York Health Board, and 1,468 cases from the Chicago Health Board.

The grand total gives 5,794 cases with 713 deaths, or a mortality of 12.3 per cent, including 218 cases which were moribund at the time of injection or died within twenty-four hours of the first injection.

In the 4,120 cases injected during the first three days there were 303 deaths, a mortality of 7.3 per cent, including every case returned. After three days have passed, however, before the injection, the mortality rises rapidly, and does not differ materially from ordinary diphtheria statistics. Yet improvement seems to have been noted in some cases even when the serum was injected as late as the fifth or sixth day.

In the 3,384 cases reported to the society by private practitioners the larynx is stated to have been involved in 1,256 cases, or 37.5 per cent. In 691, or a little more than one-half the number, no operation was done, and in this group there were 128 deaths. In 563 cases, therefore, or 16.9 per cent of the whole number, there was clinical evidence that the larynx was involved, and yet recovery took place without operation. In many of these cases the symptoms of stenosis were severe, and yet disappeared after injection without intubation. A feature which excited much surprise was the prompt arrest, by the timely administration of the serum, of membrane which was rapidly spreading downward below the larynx.

Operations were done in 565 cases, or 16.7 per cent of the entire number reported to the society. Intubation was performed 533 times, with 138 deaths, or a mortality of 25.9 per cent. In 32 cases tracheotomy only was done, with 12 deaths, a mortality of 37.4 per cent. Of the 565 operative cases, 66 were either moribund at the time of operation, or died within twenty-four hours after injection.

In the 2,819 cases not operated upon, there were 312 deaths, a mortality of 11.3 per cent.

Clinical experience seems, then, to have demonstrated the power of the antitoxin to check the extension of the diphtheritic process from the fauces to the larynx, and many observers have become convinced that fewer laryngeal obstructions occur after the administration of the antitoxin, and that more patients recover from laryngeal diphtheria without the necessity of operation.

In many cases of diphtheria, the prognosis is rendered more grave by complications and mixed infections due to other bacteria, which, when they are fully developed, do not submit to the influence of the diphtheria antitoxin. The most common and dangerous complicating micro-organism is the streptococcus pyogenes. Streptococci and other cocci frequent healthy throats, and are usually found in the cultures from diphtheritic membranes. The pathogenic action of these germs, however, occurs only when they are present in very large numbers. In such cases they succeed not only in poisoning the system by the formation of toxins, but also in gaining access to the circulation and invading the liver, spleen, kidneys, and other organs.

Our prognosis is notably influenced by the character of the prevailing epidemic, the surroundings of the patient, the intelligence of the attendants, and such other circumstances as influence the course of any of the continued fevers. Moreover, it is to be borne in mind that cases which occur during an epidemic are more apt to assume the graver form than those which occur sporadically. It should be kept in mind that even a mild case of diphtheria is liable at any time to develop grave complications.

The extension of the membrane into the nasal cavity is to be regarded as a somewhat grave complication from the fact that the propagation of the germ occurs in a cavity which very soon becomes practically closed. In this way a condition is established which is especially favorable to the development of septic infection. This may be explained not only by the imprisonment of the germ, but by the great vascularity of the Schneiderian membrane.

Treatment.—There are two important indications to be kept in mind in the management of any given case of diphtheria; these are, first, to control and counteract as far as possible the constitutional effect of the toxæmia; and, second, to limit the extension of the local inflammatory process and to destroy its infectious quality. This latter indication is emphasized by the fact that the propagation of the bacillus after it first commences in the fauces constitutes a continuous process, by which new ptomaines are rapidly manufactured, which

make their way into the general circulation, adding to the original septic infection.

Antitoxin.—To Behring belongs most of the credit of the discovery that the blood-serum of animals which have been rendered immune against diphtheria by inoculation with pure cultures of the Loeffler bacillus contains an active principle which neutralizes the toxic agent existing in virulent cultures of the bacillus. Applying this fact, it was found that this blood serum from an immunized animal possessed a preventive and curative influence against the toxin of the diphtheria bacillus in the human body. In other words, injections of a suitable amount of the serum gave immunity to the person against the pathogenic action of the Loeffler bacillus, or neutralized the toxic product of that micro-organism when already present in the body. How this effect is produced it is as yet impossible to say, but the theory most generally favored is that it acts through the agency of the living body by rendering the cells tolerant of the toxin. It may happen that the cells are in such a condition that they will not respond properly to the action of the antitoxin. This may be due to intense or prolonged action of the diphtheria poison, to previous or coexistent disease, to inherent weakness, or to some individual idiosyncrasy. Usually, however, when administered sufficiently early and in proper amount, it arrests the spread of the local inflammation caused by the bacillus. Theoretically, it requires a given amount of the antitoxic agent to neutralize the effects of a given amount of the toxin. Practically, however, we have no way of determining the quantity and the virulence of the toxin, nor the susceptibility of the patient. In deciding upon the proper amount to give, therefore, we have to be guided by the duration of the disease up to the time of injecting the antitoxin, and the locality and severity of the disease. As a consequence, it will often happen that an insufficient quantity is given, and that the injection will have to be repeated. In laryngeal cases a large initial dose is necessary. All observers agree that cases coming under treatment the first day of the disease have much more prospect of recovery, and that they require less of the remedy. The fatality in some of the hospitals is about ten per cent in cases treated on the first day of the attack, runs up to about twenty-five per cent in those receiving the first dose on the second day, and reaches thirty-five per cent in the cases in which the antitoxin is not administered until the third day of the disease. In suspicious and in croup cases it is better, according to some authorities, to give the antitoxin at once, without waiting to determine by means of the bacteriological examination whether the Klebs-Loeffler bacillus is or is not present. The failure of a case of diphtheria to respond to the timely injection

of a proper dose of the serum is asserted by many to be an indication of streptococcus sepsis, broncho-pneumonia, or some other complication due to secondary infection, over which the diphtheria antitoxin has no control.

While it appears from clinical records that the occurrence of albuminuria, nephritis, heart failure, and paralyses is not increased by the antitoxin, as has been claimed by some, it is also seen that it has not been decreased, nor have these affections been influenced in any way by the administration of the serum. Kolisko, after having made one thousand autopsies of patients who had died of diphtheria, concludes that the anatomical changes in the internal organs are the same as under former methods of treatment.

For a child over two years old, the dosage of antitoxin should be, in all laryngeal cases with stenosis, and in all severe cases, fifteen hundred to two thousand units for the first injection, to be repeated in from eighteen to twenty-four hours if there is no improvement; a third dose may be given after a similar interval if necessary. For severe cases in children under two years, and for mild cases over that age, the initial dose should be one thousand units, to be repeated as above if necessary; a second dose is not usually required. Some of the disagreeable symptoms which occasionally follow the administration of antitoxin have probably been due to the serum and not to the antitoxic substance. To prevent their occurrence, a diphtheria antitoxin is prepared by some makers which contains a larger amount of antitoxin to each centimetre. Some point on the anterior surface of the chest or abdomen, on the back between the scapulæ, or the outer surface of the thigh may be chosen for the injection. The syringe should be so constructed that it can be easily taken apart, and should be made entirely of material that can be thoroughly sterilized.

Under influence of these injections in favorable cases, general improvement occurs in from twenty-four to forty-eight hours and is accompanied by a fall in temperature. In favorable cases the local diphtheritic process is arrested usually within twenty-four hours. The membranes separate rapidly in some cases, gradually in others. Swelling of the mucous membrane disappears, and convalescence rapidly ensues. The injection of the serum may be followed in a few hours by local pain, swelling, and redness, but there is no danger of abscess formation, if the serum is uncontaminated and proper antiseptic precautions have been taken. Unpleasant after-effects sometimes occur. The most common of these is an exanthem, usually erythema and urticaria, which may be localized at the seat of injection or extend over the body. It is sometimes accompanied by fever. A

severe form of the exanthem resembles erythema multiforme and is accompanied by high fever, pain in the bones and joints, and swelling of the joints. These conditions may seem serious, but the patient always recovers.

In a number of children's hospitals and asylums, antitoxin has been used for immunizing purposes. Some of the reports encourage the hope that the use of the diphtheria antitoxin will become more general, and that the prevalence of diphtheria will in this way be to a large extent limited. Many, however, consider it unjustifiable to use so powerful an agent for the purpose of prevention, as in some cases the serum has been known to cause untoward symptoms, and it is by no means certain that without its use the patients would have developed the disease.

When it is desired to adopt this procedure, immunization is said to be effected by the administration of from one hundred and fifty to three hundred normal units of antitoxin, according to the age of the patient. The immunity ordinarily lasts about four weeks.

Topical Applications to the Membrane in the Fauces.—Among the local remedies which possess special value in rendering inert a diphtheritic membrane, I should give the first place to some of the preparations of iron, the order of preference perhaps being the officinal liquor ferri persulphatis and the liquor ferri perchloridi. If the membrane is thin and not especially efflorescent, the latter may be diluted with from one to four parts of alcohol. In applying this remedy, the patient should be placed in such a position that the parts are rendered easily accessible and are fully illuminated, when a slender probe wrapped with a small pledget of cotton is dipped in the solution and a small amount of the agent applied gently to the surface of the exudation. This is repeated until the whole of the membrane visible is thoroughly saturated with the iron. Moreover, the application should be made in such a way that the parts are in no degree injured and the application is confined entirely to the exudation.

If seen early enough in the progress of the disease, and when the exudation is still confined to the tonsils, we may hope, even by the first application, to rob the local process of much of its infective potency and to limit its capacity for extension. The patient, however, should be seen a second time at least three or four hours later, when the same process can be repeated. Very much depends on careful watching, and frequent repetition of the visits during the first two or three days of the attack.

The action of the iron is practically to antagonize and intercept the localized fibrinous process, thus rendering inert the nidus in

which the specific bacillus propagates. Its direct action upon the bacillus is probably somewhat limited. Next in efficiency to iron I should place the use of lactic acid as a local agent. This may be used in a fifty-per-cent solution, the strength being increased or decreased according to its effect.

The bichloride of mercury has received extensive trial as a local application. I have no special knowledge of its efficacy when used in this way; it certainly can have no effect on the inflammatory process, and cannot be expected to penetrate very deeply into the tissues for its action on the specific bacillus.

Carbolic acid or phenol has been used more or less extensively as a local application, but ordinarily in such weak solutions as to render it practically inert.

Many other destructive agents have been recommended by different observers, but they have not proved so effectual as the above-mentioned remedies.

Some years since pepsin, pancreatin, trypsin, and other digestive ferments were held in no little esteem as local applications to the membrane, the theory of their action being that they dissolved the exudation by a digestive process. I am disposed to think the effect of these remedies is very largely theoretical, and certainly should not feel justified in losing valuable time by trusting to their uncertain action.

The peroxide of hydrogen has been warmly commended as a topical application, by means of the spray and by inhalation.

Immediately upon the extension of the false membrane to the lining membrane of the nose, it becomes a matter of importance to arrest the process. The accomplishment of this requires careful watchfulness and somewhat deft manipulation. In order to gain freer access to the parts, the turbinated bodies should be exsanguinated as far as possible by the application of a two-per-cent solution of cocaine, after which the secretions should be delicately removed by the use of a pledget of cotton upon a slender probe, and subsequently a local application of the persulphate of iron should be made —the whole manipulation, of course, is carried out by means of the head-mirror with reflected light. This is to be repeated at intervals of from two to four hours, according to the progress of the exudation.

A diphtheritic exudation in the nose assumes always a somewhat efflorescent type, the membrane being very thick and hence the passages soon become more or less completely occluded. In such a case, of course, atomized fluid cannot be made to reach to any depth. The death rate in nasal diphtheria has been notably diminished since the systematic irrigation of the parts invaded has been the general

practice, as in this manner the main danger of the disease, namely, septic infection, may be to an extent controlled. In this view a solution of corrosive sublimate, one part in five thousand, becomes our main reliance. The best position in which the patient can be placed for carrying out this manipulation is in the sitting posture, with the head bent well forward. If the heart's action is especially feeble, we simply turn the child's head well over upon the edge of the pillow, in such a way that the face hangs downward, and then syringe into the upper nostril, allowing the fluid to escape through the lower. The nozzle of the syringe should be fitted well into the nostril, and the stream thrown slowly and gently into the cavity. If the parts are so completely occluded that a stream of water cannot be made to pass around from one nostril to the other, our dependence will be upon the local application of the disinfecting fluid by means of a pledget of cotton wound upon a slender probe and gently passed into the cavity. This manipulation should be accomplished with great care.

As before intimated, I believe that nasal diphtheria always results from the extension of the membrane from the naso-pharynx. When this latter cavity is involved, it is best medicated, probably, by means of a curved probe inserted through the oral cavity, using the solution of iron to arrest the exudative process and the bichloride solution for disinfecting purposes. In using the perchloride or persulphate of iron in the naso-pharynx, it is to be borne in mind that these parts are exceedingly sensitive; and it is well, in making this application, to dilute the officinal liquor with from two to four parts of glycerin, thus not only reducing the strength of the solution, but forming a thick and syrupy fluid, which is less apt to drop to the parts below.

Internal Medication.—The most important indication, probably, for the internal administration of remedies in an attack of diphtheria lies in sustaining the vital forces and counteracting as far as possible the toxæmia. Alcohol, in the shape of whiskey or brandy, presents us with a remedy which is, perhaps, as nearly a specific against septic infection as any that we possess. This should be given as soon as there are any indications of systemic prostration. For a child five years of age, suffering from diphtheria, the administration of from six to eight ounces of whiskey daily would probably not be excessive, although this must be governed mainly by the general condition of the patient, as evidenced most clearly in the heart-action as shown by the pulse. The spirit should be administered at intervals of from two to three hours.

While our main reliance will be on some form of alcohol, its stimulating action may be increased by the use of carbonate of ammonia

in small doses frequently administered. If the heart's action is weak, this tendency should be corrected by the administration of digitalis. If this is not well tolerated, convallaria or strophanthus may be resorted to. Digitalis and strophanthus in combination in many cases seem to give better results than when the drugs are administered singly. The use of the tincture of iron I regard as only second in importance and value to the administration of stimulants. This should be incorporated with glycerin in the proportion of one to eight, and should be given without dilution. To a child five years of age, a half-teaspoonful dose may be given every two or three hours. In this manner we get both the local and constitutional action of the drug. Whether this drug exerts any influence upon the poisonous ptomains in the blood can only be a matter of speculation. Certainly it exerts a specific action on that blood condition which we call hyperinosis, under the influence of which fibrinous exudations develop on a mucous membrane.

The mercurial treatment of the disease consists in the administration of the drug in large and frequently repeated doses from the very onset of the attack, thus bringing the patient completely under its influence as quickly as possible. I quite agree with the view that mercury is not to be regarded as a specific in diphtheria, and doubt whether the mercurial treatment has any influence upon the disease germs of diphtheria, but I am of the opinion that its action is mainly in controlling the tendency to membrane formation in the fauces and especially in the larynx and trachea. Jacobi makes the still further point that the separation of the false membrane in the trachea and bronchi is promoted by the use of the drug. We will probably get the best results from the administration of either calomel or the hydrargyrum cum creta in the full physiological dose, repeated every two hours for the first twenty-four hours, and subsequently at longer intervals, according to symptoms.

Turpentine is another remedy which is supposed to have a definite specific action on the disease. It may be given suspended in milk in the form of emulsion, or pure.

The bromine treatment consists of the internal administration of the drug in connection with its local application to the membrane in the fauces. If we base our judgment on the results of treatment as recorded in medical literature, we must regard the bromine treatment as secondary in efficacy to either the turpentine or mercurial methods.

General tonics may occasionally be indicated. Of these, preference will undoubtedly be given to quinine. This is best administered in the form of a suppository, not at regular intervals, but as indications present.

Chlorate of potash is frequently incorporated with the iron preparations for some supposed action that it exerts upon the local process in the fauces, but more especially perhaps for its oxygenating powers. The deleterious action of this drug on the kidneys should always be kept in view. When we consider the uncertainty of its action, it would probably be better omitted in most cases.

Inhalations.—Inhalations from lime have for a long time enjoyed a well-deserved reputation for use in cases in which the membrane has developed in the larynx, the method consisting in throwing unslaked lime into water, the slaking process developing steam, which is conveyed to the patient by means of a suitably constructed tent or cone. The theory is that the steam as it arises carries small particles of lime with it, and that these have a beneficial action upon the false membrane.

Sprays.—The practical value of these applications is probably limited entirely to the use of antiseptic agents; and for this purpose, in the order of preference, there may be applied bichloride of mercury, 1 in 5,000; phenol, 1 in 200; boric acid, 1 in 20; thymol, 1 in 1,000; oil of eucalyptus, 1 in 1,000, and peroxide of hydrogen. These solutions cannot be expected to penetrate the parts sufficiently to exert any controlling influence upon the morbid process in the deeper tissues.

Tracheotomy and Intubation.—In a large proportion of cases, despite all efforts at arresting the disease, the false membrane develops in the larynx and the parts below, giving rise to suffocative symptoms.

The measures already enumerated for the arrest of the disease failing, our only remaining resource practically consists either in opening the air passages or in the insertion of an intralaryngeal tube.

Regarding the question as to when operative interference shall be resorted to, no definite directions perhaps can be given, further than to say that interference must be regarded as imperative in those cases in which, other remedies failing, the laryngeal disease is progressive, as shown by the increase of dyspnœic symptoms. It is scarcely necessary to emphasize the point that very grave dangers are incurred by delaying operations, as the teaching of clinical experience in this direction is almost universal that a larger proportion of cases are saved by an early tracheotomy or intubation than when these measures are resorted to after the vital forces have been notably depressed, not only by the persistence of the blood poisoning, but by the defective oxygenation which the laryngeal process entails. The relief of dyspnœa, whether by intubation or tracheotomy, of course exerts no direct influence upon the extension of the mem-

brane; and after an operation, as we know, a majority of patients succumb to asphyxia, a stenosis subsequently developing from the pseudo-membranous deposit in the trachea and bronchi. Notwithstanding this, immense relief is afforded in most cases by the operation, and a fatal issue postponed. When we consider, therefore, the simplicity of the measure and the slight danger to life which can be directly attributed to the operation itself, there should be no question as to the propriety of resorting to it early in any given case of laryngeal invasion.

Hygienic Management of the Sick-Room.—The arrangement of the sick-chamber in a case of diphtheria should be based on our knowledge that the specific germ possesses great vitality.

All individuals who are in any degree susceptible to the disease, especially young children, of course should be removed from all possible source of contagion. The attendance upon the patient should be limited, and all intercourse between such attendants and other individuals in the house should be forbidden as far as possible. All rugs, hangings, and upholstered furniture should be removed from the room, the dress of the attendants should be restricted to cotton and linen, and the bedding of the patient should be limited as much as possible to linen or cotton sheets and woollen blankets.

Unquestionably the most important and efficient method of controlling the dissemination of the micro-organism consists in the thorough disinfection of every article which can possibly convey the germ from the body of the patient. A vessel containing a solution of corrosive sublimate, 1 to 1,000, should be kept readily at hand, into which the patient should expel all the saliva or sputa that escapes from the mouth. Every handkerchief, sponge, or towel which is used about the face of the patient should be immediately thrown into such a solution, as well as any clothing removed from the body. The vessel that is used for fecal evacuation should also contain an abundant supply of the disinfectant fluid. The hands and face of the patient as well as those of the attendants, should be disinfected in the same manner.

The further hygienic measures which should be observed consist in keeping the room at a temperature of about sixty-eight degrees, and having the atmosphere fully surcharged with moisture by means of a steam apparatus. Proper ventilation is of special importance in diphtheria, not only for its direct influence upon the patient, but also as allowing an exit into the outer air of the disease germs.

After convalescence is fully established, the patient is removed from the room, and all sheets, blankets, pillow cases, and other material of this kind are thoroughly disinfected by the mercurial

solution, and the room itself, with the mattresses, etc., fumigated by burning sulphur. The presence of a certain amount of moisture in the room adds notably to the efficiency of the sulphur fumes.

Sequelæ.—The most common of all the *sequelæ* which result from an attack of diphtheria are paralyses involving certain muscles or sets of muscles scattered throughout the body. The paralysis is the direct result of a neuritis involving either the terminal filaments, the trunk of the nerve, or the ganglionic cells of the spinal cord. This neuritis, moreover, is set up by the action of the poisonous ptomains in the blood.

In the order of frequency, the paralytic *sequelæ* of diphtheria occur in the ciliary muscle of the eye, the palatal muscles, the motor muscles of the eye, the muscles of the lower extremities, the muscles of the upper extremities, the muscles of the trunk, and the sphincters. The loss of tendon reflex is also perhaps to be classed among the paralyses. These paralyses may develop as early as the third day of the attack, or may be postponed until convalescence is established, and in rare instances may be delayed for some days after. The extent and duration of the paralysis bears no relation whatever to the severity of the diphtheritic attack, as a severe and prolonged paralysis may follow an exceedingly mild type of the disease.

As a rule, diphtheritic paralysis is not considered a very grave complication of the disease, and does not entail any very serious danger, except in those cases in which the respiratory apparatus is involved, in which there may arise a troublesome bronchitis.

Cases of paralysis of the diaphragm have been reported which terminated fatally.

The affection tends to get well of itself, in periods varying from three to six weeks, although undoubtedly the recovery is hastened by the administration of general tonics, such as barks and iron, with the addition of strychnine in appropriate doses. If the paralysis is persistent, the direct application to the weakened muscle of the continuous current of electricity will be found of material assistance, unless a better reaction is obtained from the faradic.

Intubation and Tracheotomy.

When it becomes necessary to give relief to increasing dyspnœic symptoms which threaten suffocation, we have two resources, intubation and tracheotomy. The considerations which weigh in favor of intubation are: the simplicity of its performance, the avoidance of a cutting operation, and the retention of a larger portion of the normal respiratory tract for breathing purposes. The objections to intuba-

tion are: the narrowness of the tube, the danger of its becoming occluded by the excessive secretions, the difficulty of retaining it *in situ*, and the fact that, impinging upon the mucous membrane in a state of diphtheritic inflammation, it is liable to cause erosions whereby a more open avenue is established for the entrance of disease germs into the blood.

The considerations which would seem to favor tracheotomy are that the air passages are open at a point farther distant from the primary exudation, and therefore in a situation less liable to be invaded, and that, the trachea being opened, easier access is obtained for local medication in case the false membrane extend to this region. As against tracheotomy there is the surgical operation with the administration of an anæsthetic, and the entrance of air directly into the trachea with the practical abolition of the important portion of the respiratory apparatus above, thus entailing an additional danger of the supervention of bronchitis and perhaps of pneumonia.

Without discussing at length these various considerations, their comparative value can only be practically established by reference to the results obtained by resort to the different methods of procedure.

In statistics which do not regard the age of the patient we find that practically the percentages of recoveries in the two operations is about the same; in tracheotomy it being 27.14 per cent, while in intubation it is 27.2 per cent, taking the latest statistics.

If, however, we examine the statistics compiled with reference to the age, we find that a greater proportion of children under five years of age can be saved by intubation. This has been brought out by the statistics of Stern and Bourdillat.

Comparing these statistics, we find that intubation performed on children under two years of age gives us a gain of 12.5 per cent; between two and two and a half there is a gain of 12.5 per cent; between two and a half and three and a half there is a gain of 11.9 per cent; between three and a half and four and a half there is a gain of 3.7 per cent; between four and a half and five and a half, a loss of 6.7 per cent; and over five and a half there is a loss of 2.2 per cent.

It seems clear that intubation promises the best results in children under four years of age; between four and five a decision should be based mainly on the consent of the parents, the surroundings of the child, and other considerations. After the age of five, tracheotomy promises a better hope of saving the patient.

If there is any indication that the exudation has invaded the trachea and air passages below, intubation affords even less hope of relief than tracheotomy. I am disposed to think that a patient is safer from accident with a tracheotomy tube properly inserted than

with an intralaryngeal tube, when the skill and discretion of the attendant cannot be depended upon.

It is my belief, however, that the number of lives which have been saved by the introduction of this method by O'Dwyer is far greater than is suggested by a comparative study of the statistics of intubation and tracheotomy.

A complete set of O'Dwyer's instruments for children consists of, *first*, six tubes of different sizes, and varying from one and a half to two and a half inches in length; *second*, an introducer; *third*, an extractor; *fourth*, a mouth gag, and *fifth*, a scale.

The tube is an ovoid cylinder, bulging at its centre, and is fitted with a rounded head at its upper extremity, which lies upon the

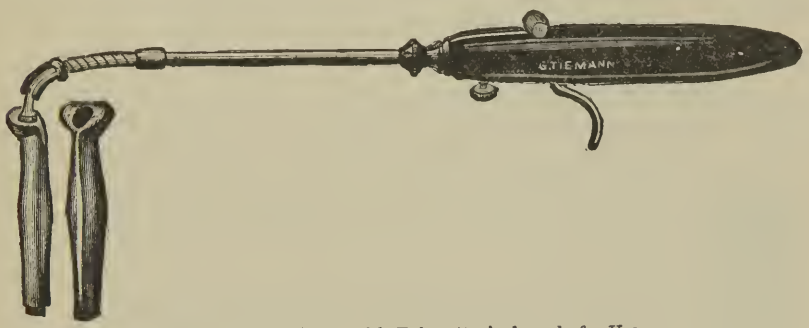

FIG. 109.—Introducer with Tube attached ready for Use.

ventricular bands when *in situ*, thus preventing the instrument from falling into the trachea. The anterior angle of the head is perforated for the insertion of a cord, whose use is for the prompt recovery of the instrument in case of failure to properly insert it in the larynx, the blocking of the tube by detached membrane, or other accident.

The introducer (see Fig. 109) consists of a long slender rod fitted with a handle. Outside of the rod is a sliding tube, operated by the button seen on the upper surface of the handle. The distal extremity of the introducer is a long jointed rod, curved to a right angle with the shaft, which passes completely through the intralaryngeal tube. That portion of the introducer which fits into the laryngeal tube is jointed in such a way as to facilitate its withdrawal. The object of the sliding portion of the introducer is to detach the laryngeal tube after it has been placed in the larynx.

The extractor (see Fig. 110) is an instrument devised for withdrawing the tube when desired; its action will be easily understood by the figure. It is constructed on the principle of the curved forceps, with the exception that the small blades seen at its distal extremity are in apposition. When this instrument is inserted into the upper

end of the laryngeal tube, the small blades are opened by pressing on the lever, thus enabling the operator to withdraw the tube. The small set screw in the handle of the lever is to regulate the extent to which the blades are opened, especially with reference to the avoid-

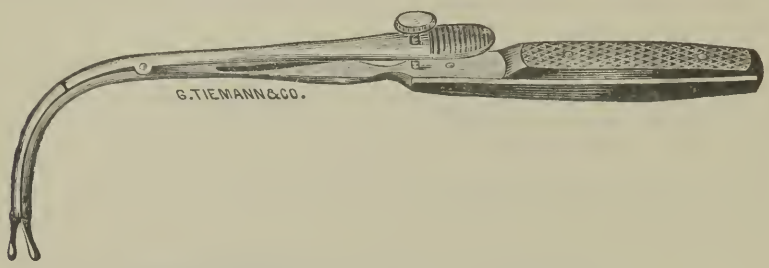

FIG. 110.—Extractor for the Removal of O'Dwyer's Tube.

ance of injury to the surrounding parts in case the instrument is inserted outside of the tube.

The mouth gag recommended by O'Dwyer is the Denhardt instrument (see Fig. 111), the handles of which are bent back in such a manner as to hamper the manipulation in the least degree.

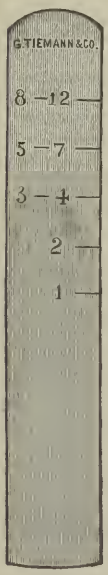

FIG. 112.—The Scale.

The scale (see Fig. 112) has been arranged by O'Dwyer to show the size of the tube best fitted for the different ages: thus, a tube reaching from the lower end of the scale to No. 1 is the size adapted for children a year old; to No. 2, for children two years old, etc.

Method of Operating.—The child should be placed in a sitting position in the lap of an attendant, with the head resting firmly against the shoulder, the hands being held or firmly secured by a binder passed around the body; the gag is then inserted into the left side of the child's mouth as far back as feasible; an assistant stands immediately behind the child, holding its head firmly and slightly elevating the face. The operator, standing immediately in front of the patient, with the introducer held lightly in his right hand, passes his left forefinger into the fauces and searches for the epiglottis, or

FIG. 111.—Mouth Gag.

failing to find this, for the cavity of the larynx. As soon as he is convinced that the tip of the forefinger is beyond the epiglottis and immediately over the cavity of the larynx, the handle of the introducer is brought down upon the chest of the child, while the tube is passed back into the fauces along the side of the left index finger, acting as a guide. The handle of the introducer is then elevated, and at the same time the distal extremity of the tube carried backward along the index finger until it is immediately over the laryngeal entrance, when it is directed downward and carried quickly into position, the successful introduction of the tube being ascertained by the left index finger. As soon as the tube is *in situ*, it is detached from the introducer by pushing forward the sliding tube by means of the button on the upper surface of the handle, the manipulation being aided by the firmer grasp of the instrument, which is secured by the index finger on the small trigger which is seen on the lower side of the handle of the introducer.

In withdrawing the instrument, the joint in that portion of the distal extremity of the introducer which fits into the tube enables the operator to extract it in an almost direct line, thus avoiding the awkwardness of manipulation which would otherwise be occasioned. During the removal of the obturator it is necessary to keep the index finger of the left hand on the shoulder of the laryngeal tube, to prevent its withdrawal with the obturator, and also to assist in the removal of the cord which has been attached to its rim. This, of course, should not be done until the success of the operation is demonstrated in the relief of dyspnœic symptoms.

When we consider that this operation is done for the relief of one of the gravest and most distressing conditions which the physician is called upon to meet, and, furthermore, that in many cases the child is struggling and choking from imminent asphyxia, it is easy to appreciate how absolutely necessary for the success of the manipulation are great manual dexterity and perfect self-control. Each successive step in the procedure must follow promptly and without the slightest hesitation, and no time is to be wasted in searching for anatomical regions. The whole procedure should probably not occupy over from five to eight seconds, and if the first attempt fails it is better to give the patient an interval of rest rather than to prolong the effort beyond this period.

The operation is not always unattended with accidents, such as the detachment of the membrane below the tube, whereby its calibre is occluded, the insertion of the tube into the œsophagus, and the laceration of the soft parts. The first of these accidents is one that cannot always be avoided; its occurrence is immediately recognized,

and necessitates the prompt withdrawal of the instrument, and in most instances the subsequent performance of tracheotomy. The insertion of the tube into the œsophagus may very easily occur from the failure to elevate the handle of the introducer sufficiently to bring forward the distal extremity of the tube. Such an accident may be suspected if the tube passes down beyond the reach of the left index finger in the fauces, and, further, by failure to relieve dyspnœa. It is not an accident of any gravity, and simply demands a renewed attempt. Injury to the soft parts should occur only from rude and unskilful manipulation, and is scarcely a justifiable accident, as the operator should always be assured of the position of his instrument at each stage of the manipulation. The accidents which may occur when the tube is *in situ* are its occlusion by secretion or detached membrane, ulceration of the soft parts, its expulsion during the act of coughing, interference with deglutition, and the entrance of food into the air passages during this act. If the tube becomes occluded from any cause, it must be removed, cleansed, and reinserted. In case of failure to relieve the symptoms in this way, tracheotomy is the only further resort. Ulceration of the soft parts is the result of pressure from the collar of the tube, and also of pressure on the trachea by its lower extremity. It is not an accident of much gravity, and is usually the result of long-continued wearing of the tube. It can be obviated only by changing the shape of the tube and adapting it to the conditions that arise. The expulsion of the tube in the act of coughing cannot always be avoided, though it usually arises from the instrument being too small, in which case a larger and more closely fitting tube should be introduced. One of the gravest difficulties which is encountered is in the interference with the act of deglutition which the presence of the tube entails. This is one of the most difficult features to overcome after intubation, and is present to a more or less well-marked degree in the large majority of cases. The only thing to do to meet this symptom, if it presents to such a degree as to prove a source of great annoyance, is to restrict nourishment largely to fluids, these being more easily expelled from the trachea than solids. If, however, they are taken very slowly, they may pass into the œsophagus without entering the larynx. Failing other measures, the child can be placed on its chest and made to draw fluids through a pipette.

The length of time which the tube should remain *in situ* depends largely on the progress of the case as evidenced by general symptoms. If the febrile movement subsides and the tendency to formation of a false membrane in the fauces disappears, and convalescence seems established, the tube should of course be removed,

Practically, we allow it to remain as long as there is any dyspnœa to overcome.

In one hundred and fifty-eight successful cases collated by O'Dwyer, the average time during which the tube was retained was five days and two hours; in his own cases, the longest time was fourteen days and the shortest fourteen hours. He further states that the younger the patient the longer the tube will be required; in children under two years it is rarely safe to take it out under seven days.

The removal of the tube is generally considered a somewhat more difficult manipulation than its insertion. When this is to be done, the index finger of the left hand is passed into the laryngeal opening until the collar of the tube is felt in the larynx, when the extractor, held in the right hand, its distal extremity guided by the left forefinger in position, is passed along until it comes into position immediately over the upper extremity of the laryngeal tube, when it is passed into the aperture, and, its blades being separated by the pressure on the lever, the tube is grasped in such a way that it may be withdrawn.

CHAPTER LXV.

SYPHILIS OF THE FAUCES.

The mucous membrane of the fauces seems to be a favorite site for the manifestations of syphilitic disease in its various stages. It is involved, probably, in a given number of syphilitic patients far more frequently than any other portion of the body, with the possible exception of the skin. This is partially explained, perhaps, on the ground that the skin and mucous membranes are somewhat intimately associated, both from a physiological and pathological point of view. This, however, suggests no explanation of the fact that the mucous membrane of the upper air tract is more frequently involved than mucous membranes elsewhere. The principal reason of this is found, perhaps, in the near location of the parts to the outer world, and the frequency with which they are involved in chronic morbid processes, whereby the local manifestations of the specific disease are to an extent encouraged.

The manifestations of syphilis which we meet with in this region are: *first*, the primary lesion; *second*, erythema of the fauces; *third*, the mucous patch; *fourth*, the superficial ulcer; *fifth*, gummatous deposits; leading to *seventh*, the deep ulceration of syphilis; and, *eighth*, cicatricial deformities.

The Primary Lesion.

The possibility of the entrance of the syphilitic virus into the blood through the mucous membrane of the fauces, as evidenced by the existence of a hard chancre in this region, would naturally be regarded as exceptionally remote. An examination of the literature, however, shows us that it is by no means a rare occurrence. The mucous membrane of the palate, faucial pillars, and pharynx, presenting, as it does, a somewhat dense tissue coated with squamous epithelium, affords little opportunity for the entrance of the syphilitic virus. The surface of the tonsil, however, on the other hand, with the open mouths of its crypts, presents an exceptionally favorable site for the lodgement of the virus. Hence, the consideration of the

primary lesion in the fauces is confined practically to chancre of the tonsil.

Etiology.—An erosion of the mucous membrane is usually considered necessary for the entrance of the virus. This is not, I think, a common condition of the tonsil. Hence the suggestion is a plausible one that, the poison lodging in the tonsillar crypt, it sentrance into the circulation is aided by a certain permanency of contact.

In many cases reported, the source of the disease was in impure practices, while in others it arose from kissing, the use of drinking-vessels, pipes, etc.

The disease usually occurs in adults, but is more frequent among men than women.

Symptomatology.—In most instances the chancre occurs upon an hypertrophied tonsil, which, as before stated, seems to prevent favoring conditions for the entrance of the virus. The local morbid process is usually of an aggravated character—more so than when the sore is situated upon the penis.

The first symptom to which it gives rise is that of an aggravated sore throat, with pain in deglutition. This, in spite of ordinary treatment, increases in a marked way, until the local symptoms are of a distressing character, the tonsil becoming notably enlarged as the result of the inflammatory action, which involves the tissues beyond the borders of the local sore, while the pain becomes constant and assumes a lancinating character.

Very early in the history of the disease, the submaxillary and cervical glands of the affected side are indurated. This cervical bubo is of a much more serious character than that which occurs in the groin, being larger and at the same time tender to pressure and painful. No case of suppuration, however, has been observed.

Diagnosis.—The characteristic appearances which enable us to recognize a chancre of the tonsil are in the somewhat sluggish ulceration which ensues, together with the induration surrounding it and the unilateral enlargement of the cervical and submaxillary glands. The lesion presents the ordinary appearances of chancre, with this exception, that in most instances it covers a wider area, involving more or less of the whole surface of the tonsil.

The surface of the ulcer is granulated in appearance, of a grayish color, and is covered with inspissated mucus. There is ordinarily no evidence of destruction of tissue, although the ulcer has been known to take on something of a phagedenic character. The induration usually involves the whole of the tonsil, and is thus somewhat dependent upon the amount of hypertrophy of which the organ is the seat. If the lesion is a small one, we meet with the ordinary

button-like induration of chancre of the penis. The surface of the ulcer is usually flush with the surrounding tissues, and hence presents none of the appearances met with in the gummatous ulcer of syphilis.

If there is any doubt in the diagnosis of a given case, the early appearance of the eruption will serve to clear it up. This may be looked for in from two to four weeks after a primary lesion in this locality. The secondary eruption, moreover, is in many instances of a papular character, still further indicating a certain activity of the virus, in that a cutaneous syphilide of this variety is usually postponed until the third or fourth month.

Erythema of the Fauces.

This manifestation of syphilis belongs usually to what is called the secondary stage, and occurs from six weeks to four months after the primary lesion. It consists of a peculiar discoloration of the mucous membrane of the fauces, which presents certain appearances that are almost characteristic of specific disease. The discoloration of the membrane seems to consist of a passive hyperæmia, in which the veins seem to take the prominent part. In consequence of this, the color of the membrane is of a dark red, slightly verging on a purplish hue. This *appearance* is attended with no perceptible swelling of the part, nor is there any notable hypersecretion.

The eruption confines itself entirely to the soft palate and pillars of the fauces, the posterior wall of the pharynx not being usually invaded to any perceptible extent, although it may be the seat of a certain amount of discoloration.

The appearance which is characteristic of specific disease, and which differentiates this eruption from any other with which I am familiar, consists of the sharp line of demarcation between the affected membrane and the healthy tissue beyond. This appearance I regard as almost pathognomonic of syphilitic erythema. The discoloration is of a uniform dull red color.

In many instances the tonsils are also invaded by the eruption, and present a slightly swollen appearance with the same peculiar *change in color*. This, however, is not the invariable rule.

The onset of this condition is somewhat insidious, and usually gives rise to no symptoms which would call attention to any local disorder in the fauces. In most instances, probably, it is discovered on an inspection of the throat for diagnostic purposes.

While the eruption usually appears in connection with a cutaneous erythema, it may also occur coincidently with a papular or erythe-

mato-papular syphilide. According to Mauriac, where we have the cutaneous erythema assuming a circinate or annular form the same appearance is reproduced in the faucial eruption.

An erythema of the fauces, then, is closely analogous and practically the same as the cutaneous erythema. Mauriac recognizes a still further analogy in the desquamation which occurs from the faucial mucous membrane with the subsidence of the eruption.

The Mucous Patch.

This is one of the earliest and most persistent of the specific manifestations with which we meet in the fauces. It is usually classified as belonging to the secondary stage of the disease; and although it is more frequently met with in the earlier stages of syphilis, it may occur at any period. The usual period for its first occurrence is from six weeks to three months after the primary sore. It bears no direct relation to any individual cutaneous eruption, but manifests itself quite independently of them. According to Keyes, it occurs usually in connection with papular eruptions of the skin, and may outlast several crops of the different eruptions. It is of course a local manifestation of the blood poison. While, as before stated, it most frequently develops in the early history of the disease, it would seem that there is no period of syphilis which is exempt from its occurrence.

The mucous patch is probably by far the most contagious of all secondary manifestations of specific disease, and is quite as contagious, if not more so, than the primary sore. Moreover, direct contact is not necessary for transmission, in that the saliva and mucous secretions of the mouth may convey the contagious material. In discussing, in a former chapter, the question of the transmission of syphilis to offspring, the view was taken that this was impossible if three years had elapsed in either parent after the occurrence of the primary sore. If this be true, it must follow that, after the lapse of a similar period from the primary lesion, it is impossible to convey the disease to another through the secretions of any of the various local lesions. Hence, while the earlier mucous patch is exceedingly contagious, those which occur later than three years must be regarded as innocuous in this respect.

Symptomatology.—The presence of these patches ordinarily gives rise to no very marked subjective symptoms other than a sense of discomfort and stiffness in the parts, which is aggravated by the act of deglutition. Their special feature consists in their acute sensibility, under which they become exceedingly painful to the impact of

even mild and unirritating food or drink, and may even become so distressing as to interfere with proper taking of nourishment.

Diagnosis.—In its early stages, a mucous patch presents as a small, bluish-white, opalescent area lying upon an apparently healthy mucous membrane. Being the result of an infiltration, the membrane is naturally to a slight extent thickened at this point, although this is not ordinarily appreciable on inspection. In appearance, it so closely resembles an area of mucous membrane which has been recently touched with a stick of nitrate of silver that even an experienced observer might find it difficult to distinguish between the two conditions. A single patch is something of a rarity, in that they usually appear in groups of small patches, scattered about on one or the other side of the fauces. The early patch usually makes its appearance, somewhat in the order of frequency, on the soft palate and uvula, the anterior face of the anterior pillar, the face of the tonsil, and the anterior face of the posterior pillar. It never is seen on the pharyngeal wall.

It is now universally accepted that syphilis is not auto-inoculable, and yet, in connection with mucous matches in the fauces, we very frequently meet with a somewhat curious and yet characteristic appearance, in which a chain of mucous patches on one side of the throat has been exactly reproduced on the other side, giving rise to what has been called the Dutch-garden aspect of faucial mucous patches, so named because the group presents an absolutely symmetrical appearance on both sides. It is the universal teaching that an inoculation of the secretions of a mucous patch can only give rise to a primary sore. In the case of the mucous patch, therefore, we must content ourselves with the view that the frequent contact of the patch on one side of the fauces has given rise to a similar condition on the opposite side, without regarding it as evidence of the auto-inoculability of the disease.

If the disease has persisted for some time the patches and the surrounding membrane become thickened and indurated and in consequence of the frequent movements of the parts, cracks and fissures form which easily bleed. This is especially true when the disease occurs on a fold of mucous membrane, as on the edges of the palate or faucial pillars.

This condition constitutes what is generally known as the scaly patch, and may develop from the soft, smooth patch of the early stages of the disease as the result of its persistence, or it may be met with in the later stages of the disease, five and even ten years after the primary sore. In this stage also we find it making its appearance on the posterior wall of the pharynx for the first time.

Course and Prognosis.—This local manifestation of syphilis is probably one of the most obstinate with which we have to deal, for, although quite amenable to local and constitutional treatment, these patches frequently recur with a persistence which is oftentimes equally annoying to the patient and the physician. This is especially true of the scaly patch, which occurs in the later stage of syphilis.

The ordinary mucous patch shows no marked tendency to undergo ulcerative action. When, however, it has developed into the thick broad and scaly patch, as the result of persistency or under the local irritating influence of alcohol, the use of tobacco, or some other cause, the activity of the cell proliferation becoming thereby increased, tissue necrosis is liable to occcur, whereby the whole mass breaks down into ulcerative action, giving rise to the superficial ulcer of syphilis.

The Superficial Ulcer.

This form of ulcer is usually regarded as belonging to the secondary period of syphilis, and is met with in from one to three years after the primary lesion. As before stated, it may occur as the result of the breaking down of tissue in the erosive mucous patch. This, however, is not its ordinary method, for in the very large majority of instances it undoubtedly results from the breaking down of a gummatous deposit.

The essential pathological lesion which gives rise in the one case to a mucous patch, in another case to the superficial ulcer, and still later to a deep ulcer, is practically the same in all, the only difference being in the extent of tissue involved. In the mucous patch the infiltration is very superficial, and shows little tendency to ulceration. In the superficial ulceration, on the other hand, the infiltration extends into the deeper tissues of the mucous membrane, and early ulceration is the rule. Again, in the deep ulcer the infiltration extends not only into the mucous membrane, but into the tissues beyond, and in breaking down gives rise to the peculiar crater-like ulcer of late syphilis.

No special reason can be assigned for the occurrence of this form of ulcer other than that the specific virus which constitutes the disease, reproducing itself in the blood, increases in intensity in such a way that as the years go by a localized outbreak in the faucial mucous membrane assumes a more active type.

In the order of frequency, it is met with on the tonsil, the soft palate, the anterior pillar, and the plica salpingo-pharyngea. In one or two instances I have observed it on the upper surface of the soft palate, an exceedingly rare location.

It usually occurs in a somewhat elongated ovoid form, and shows but slight disposition to extend. Moreover, as in other forms of ulceration in this region, there is a notable hesitancy in transgressing anatomical boundaries. The primary gummatous deposit, occurring as it does in soft yielding tissues, gives rise to no marked symptoms which direct attention to any lesion in the throat. Moreover, it is probable that the ulceration follows so rapidly upon the deposit that the occurrence of the latter might be easily overlooked.

When the ulcer has fully developed, the patient is conscious of a sense of uneasiness and stiffness in the parts, with a certain amount of dysphagia. This latter symptom is somewhat dependent upon the location of the ulcer.

Diagnosis.—The recognition of these ulcers is ordinarily quite simple, by ocular inspection.

As already stated, I do not believe these ulcers possess any notable tendency to extension. This is due to the fact that the whole of the primary gummatous infiltration breaks down and disappears in the ulcerative action. If neglected, the ulcerative process may persist for a considerable period, and, acting as a point of local irritation, undoubtedly serve to invite to this point a new deposit of gummatous material, and as a result there occurs an extension of the ulcer. In other words, I do not believe that syphilitic ulcers extend by a progressive infiltration of the tissue with gummatous material, but rather by periodical explosions, as it were.

The Gummy Tumor.

This term, in the present consideration, is restricted to those rare instances in which the infiltration of the tissues with gummatous material assumes the form of a distinct tumor of the fauces.

In the very large majority of instances, when the deeper tissues become the seat of a gummatous infiltration the breaking down occurs so rapidly that when the case comes under observation it presents as the deep ulcer rather than as the gummy tumor. In rare instances, however, the breaking down is delayed, and the case presents itself in the form of a tumefaction; hence it becomes a matter of some importance to recognize it as such, in order that the extensive destruction of tissue which the ulcerative process naturally involves may be avoided. It belongs to the later stages of syphilis, and occurs from five to fifteen years after the primary lesion.

It is not easy to determine how long a gummy tumor may exist before ulceration. It is probably dependent on the location. A gumma of the posterior wall of the pharynx being necessarily subjected

to a great deal of mechanical irritation and pressure in the act of deglutition, it would seem that in this location it should break down quite early.

According to Zeissl, the most frequent site for gummy tumors of the palate is on its posterior surface; and when they develop here they may persist for quite a prolonged period of time, and escape observation until ulceration occurs.

The symptoms to which a gumma of the fauces gives rise seem to be mainly those of mechanical interference with the function of the parts, both in deglutition and phonation.

The pathological changes which constitute a gummatous deposit in the faucial mucous membrane differ in no essential degree from that involving the nasal mucous membrane.

Diagnosis.—The recognition of a gummatous tumor of the fauces is always a difficult problem. The tumor is hard, dense, resisting, not especially painful to the touch, and unattended with any evidences of inflammatory action, the mucous membrane covering it being of a paler hue usually than the normal, the blood-vessels of the mucous membrane investing it being exsanguinated by the pressure of the tumor. In the soft palate it is usually a rounded symmetrical mass, while in the pharynx it may be somewhat irregular in outline, and usually is unilateral, except in the case of the broad superficial deposits.

In the soft palate the main question of differential diagnosis lies in the exclusion of adenoma and fibroma, while in the pharynx it lies between fibroma, sarcoma, and carcinoma. These questions will necessarily be decided on the general appearances of the growth, together with the clinical history in each individual case, and many instances will only be definitely determined by the experimental administration of antisyphilitic remedies.

The Deep Ulcer of Syphilis.

This lesion of syphilis is the direct result of the softening and breaking down of the gummy tumor, and therefore belongs essentially to what is termed the tertiary form of the disease. The extent of area and the depth of tissue involved, as we have before seen, are entirely dependent upon the extent and area of the original gummatous infiltration. As before noted, the longer the period which has elapsed since the primary lesion, the deeper and more extensive are the gummatous deposits liable to be. Hence, the extent of the ulcerative process is entirely governed by the extent of the original infiltration.

We have already discussed the pathology and clinical history of

this form of syphilis, in connection with diseases of the nasal passages, and what was there stated in regard to the disease in the nasal cavity is equally true in connection with the same lesion in the fauces.

A gummy deposit comes on with great suddenness, involving a certain extent of tissue and giving rise to adventitious tumefaction. This, as we have already seen, may persist for a few hours, or in rare cases for a number of days, when the mass softens and breaks down, giving rise to an ulcerative process.

It is a common belief that the ulcer extends by a more or less rapid process of erosion of tissue, under the influence of the syphilitic virus. This I believe to be a wrong view. If there is any extension of the margin of the ulcer, it is due to the fact that the cellular infiltration in the periphery of the gumma is less dense than that of the centre, and hence, while the process extends, it is a slow process, but still entirely influenced by the previously existing gummatous infiltration.

By far the most frequent site of this form of ulcer is the posterior wall of the pharynx; next in frequency we find it in the soft palate and pillars, and lastly in the tonsils. If it attacks the pharynx, it rapidly involves the whole of this region, limiting itself at the posterior pillars laterally, the level of the larynx below, and the pharyngeal tonsil above, although it is no rare event to find it extending somewhat into the vault of the pharynx. I have never seen an instance, however, in which it involved either the nasal cavity or larynx by extension.

When attacking the soft palate, it produces rapid destruction of the part, but still confines itself to the original deposit. In most instances it is unilateral, thus showing a hesitancy in transcending the median line. If it occurs in the tonsil, in rare instances it passes into the soft palate, although I regard this as an unusual event.

In asserting that the ulcerative process does not extend beyond the site of the original gummy deposit, the idea is intended to be conveyed that there is no new and progressive deposit of gummatous material beyond the site of the original ulcer. As evidence that the ulceration involves only the original gummy deposit, however, I have frequently seen, not only in the pharynx but in the soft palate, a deep ulcer limiting itself to a small portion of the organ, and which persisted for days and even weeks but showed no tendency to extend to the neighboring tissues.

Symptomatology.—The occurrence of the ulceration usually gives rise to an aggravation of the symptoms which may have previously existed in a case of gummy tumor; the pain on deglutition becomes

more marked and the movements of the fauces more hampered, while at the same time there is a very notable increase in the secretions of the part. The prominent symptom, of course, is pain on deglutition, while the other symptoms to which the disease may give rise are dependent upon the character and location of the ulcer. If the palate is involved, this is very rapidly destroyed. Hence its function is abolished, and food and drink are liable to make their way into the nasal cavity.

Serious hemorrhage as the result of destruction of blood-vessels is an exceedingly rare accident, although this possibility should be borne in mind.

Articulation, of course, is interfered with, according to the location and extent of the ulcer.

Diagnosis.—The appearances of this form of ulcer in the fauces are the same as those already described in connection with the nose.

After the ulcerative process has exhausted itself in the throwing off of the gummatous matter, it is liable to assume a somewhat sluggish although persistent form, in which there is but a limited effort at repair, owing probably to the systemic poison. Under the administration of remedies, however, the reparative effort seems to be characterized by great activity.

Sequelæ.—If the disease attack the soft palate or tonsils, the only sequelæ to be considered are the vigorous cicatrization and contraction of the tissue, with the resulting deformity. When the ulceration is situated in the pharyngeal wall, in the very large majority of cases it extends through the whole depth of the mucous membrane, resulting in its complete destruction. A deeper involvement of tissue is an exceedingly rare event, although the deposit may occur primarily in the vertebral periosteum, resulting in bony necrosis and this necrosis may even result in an exposure of the spinal cord. A further sequel may be a purulent meningitis.

Cicatricial Deformities of the Fauces.

I know of no lesion except those following burns which are succeeded by more marked cicatricial contraction of tissue than the deep ulcer of syphilis in the fauces. When the ulceration has been slight, whether on the soft palate or pharynx, the reparative process results in a cicatrix which is characteristic. Our main interest in this connection, however, is confined to cases in which the ulceration has invaded such large areas of the fauces that, in healing, extensive cicatrices have resulted, and in contracting have produced notable deformity of the parts.

On first inspection of one of these cases, the impression is given that these abnormal adhesions and deformities are the result of union between two ulcerated surfaces, and that the condition has arisen from an involvement of the soft palate, pillars, and the wall of the pharynx in ulcerative action. If we study these cases more closely, I think we will find that the abnormal adhesions between the velum and pharynx are the result primarily of an adhesion of a normal palate or pillar to an ulcerated pharynx, or *vice versa*, perhaps. After the adhesions have occurred, the subsequent healing of the ulcer must be regarded as the main source of the extreme degree of deformity which is so frequently seen in these cases.

A very common variety of deformity is an adhesion between the posterior faucial pillar and the pharyngeal wall. The condition gives rise to no very marked symptoms, for the palato-pharyngeal space is sufficiently wide to admit of free respiration, while the palate is still capable of performing its normal function. The only important symptom which may arise is an impairment of hearing on that side. This is due in part to a closure of the Eustachian tube and in part to an interference with the movements of the muscles which have to do with the renewal of air in the middle ear.

Another deformity which may arise is caused by an ulceration of the soft palate, resulting in a more or less complete destruction on one or both sides. The cicatrization and contraction following give rise to an inflexible condition of this organ, the act of deglutition becoming impaired and fluids making their way into the nasal cavity. The voice also assumes a curious nasal twang, and articulation is markedly interfered with.

By far the most common seat of the deep ulcer, as we have found, is in the pharyngeal mucous membrane, and hence the most frequent deformity is found to be adhesions between the soft palate and the pharyngeal wall. In this case there is usually not of necessity any loss of tissue of the soft palate, but the velum, becoming adherent to the pharyngeal wall, when the subsequent cicatrization and contraction occur it is drawn downward and inward in such a way as to produce, not only more or less complete occlusion of the naso-pharyngeal passage, but also an asymmetrical condition of the parts.

The original adhesion probably occurs in but a limited extent on the free border of the palate, but, as the palate is held in contact with the ulcerated surface, the amount involved in the adhesion increases, so that we may have the upper surface of the palate adherent to the pharynx for a considerable portion of its area.

The uvula may remain pendulous, or it may be closely adherent to the pharynx and practically lost in the cicatrix.

If the condition has resulted from a unilateral pharyngeal ulcer, we have simply adhesion of one side, with a very marked narrowing, as the result of contraction of the opening between the free portion of the palate and the pharyngeal wall of the opposite side. Occasionally we meet with complete closure of the palato-pharyngeal space.

In the many cases of this form of adhesion which have come under my own observation, I have seen none in which complete closure has occurred, although many admitted only of the passage of a very small probe.

The accumulation of the secretions in the nose, with inability to clear the passages, becomes a source of very great annoyance. The deformity involves serious discomfort and perhaps personal mortification, rather than any special danger, the most serious symptom, perhaps, being that of impairment of hearing.

The special appearance of the throat which is characteristic of syphilis, of course, is the cicatrization with extensive contraction. The only lesion with which it could possibly be confounded would be lupus. In this latter disease, however, we meet with a nodular infiltration, marked thickening of tissue, total absence of cicatricial contraction, as evidenced by the presence of bundles of fibrous connective tissue with distortions, and furthermore we rarely, if ever, in lupus, meet with an ablation of the palato-pharyngeal space as the result of adhesions. Moreover, lupus of the air passages is generally accompanied by a similar lesion in some portion of the integument.

The practical result of these deformities, if extensive, especially when located low down in the pharyngeal wall, is the formation of a stricture. If the ulceration has extended to the two pillars of the fauces, and they become adherent, the cicatricial contraction drags the tongue backward and downward, thus increasing the stenosis, and giving rise not only to obstruction in deglutition, but occasionally to dyspnœa.

When the original deposit with ulceration occurs in the soft palate and pillars and extends to the base of the tongue, we have a circular contraction, as it were, occurring at the isthmus, which may draw the tongue upward toward the palate, while at the same time the pillars are drawn inward, thus leaving a mere rounded opening at the entrance of the pharynx, interfering with deglutition, but not necessarily with the entrance of air to the lungs.

I know of no case in which the gummy tumor or the subsequent ulcerative process has extended by continuity of tissue into the œsophagus; hence these pharyngeal strictures stop at the œsophageal orifice.

Treatment of Syphilis in the Fauces.

The Primary Lesion.—The main interest of the hard chancre in the fauces attaches to the question of diagnosis. When recognized, however, as we have already seen, the local ulcerative action is of a more active character than that usually met with in the penis. The control of this destructive process, therefore, becomes an indication for treatment. This consists in thoroughly cleansing the parts by means of a simple lotion, after which the surface of the ulcer should be coated with iodoform or europhen. This process should be repeated daily.

I doubt the efficacy of caustics, such as nitrate of silver and nitric acid, or the acid nitrate of mercury, in controlling the progress of a syphilitic ulcer of any variety, and should not indorse their use for this purpose.

Internal medication should be deferred until the diagnosis is fully established by the appearance of the eruption or other secondary manifestation.

The Erythema of the Pharynx.—The extent of the local inflammation in this manifestation of syphilis is of an exceedingly trivial character, and rarely gives rise to any local symptoms. When present, they are of the ordinary catarrhal-pharyngitis type, and should be treated practically by the same methods as a non-specific inflammation.

The Mucous Patch.—When a mucous patch makes its appearance in the fauces the case should be watched with the greatest care and the treatment followed up faithfully and with perseverance, for we have here to deal with one of the most persistent of lesions, and, furthermore, one in which there is a decided tendency to extension, not only by a continuity of tissue, but by the development of new patches. Furthermore, if not actively combated, it shows a disposition to become a chronic local affection of the faucial mucous membrane.

The main indication for treatment consists in the thorough destruction of the patch by the application of some efficient caustic agent; and of these there is none better than nitrate of silver, either in the solid stick or saturated solution. This is to be carefully applied until each individual patch is thoroughly saturated with the caustic. The applications should be made daily, or at least every alternate day, until the morbid process is observed to be thoroughly under control.

In addition to this, the use of alcohol, and especially of tobacco, should be strictly interdicted, while at the same time the patient

should be directed to avoid the use of all condiments, highly spiced food, etc. If the patches spread over a considerable area and give rise to much pain in deglutition, relief may be afforded by the local application of cocaine, a four-per-cent solution of which may be placed in the hands of the patient. Soothing gargles may be used with good effect.

The Superficial Ulcer.—Both the local and general treatment of this manifestation of syphilis in the fauces is identical with that already given in discussing the treatment of a similar lesion in the nose.

The Gummy Tumor.—The only difference between a gummy tumor in the fauces and that of the nose is that in the former situation it runs a much more rapid course, the tissue soon breaking down and giving rise to the deep ulcer. On account of its location in the fauces, however, it may give rise to prominent symptoms.

The only method by which the tumor can be dissipated is by the internal administration of the iodides, in the manner already discussed in connection with the gummatous tumor of the nose.

The Deep Ulcer.—This lesion of syphilis, when involving the nasal cavity, as we have already found, is usually attended with bony necrosis, which markedly complicates its clinical history. In the fauces, however, we have to deal with an ulceration confining itself entirely to the soft parts, except in a few rare instances. Its treatment, however, is practically identical with that of a similar condition in the nasal cavity, and consists in the early administration of full doses of the iodide of potassium, together with the local application of iodoform or europhen after the surface of the ulcer has been thoroughly cleansed.

Cicatricial Deformities.—By far the most common deformity with which we are called upon to deal in this region is that in which the soft palate is adherent to the pharyngeal wall.

The division of the adhesion, ordinarily, is a somewhat simple matter; the great difficulty which is met with is in maintaining the artificial opening after it has been made. Various procedures have been adopted to prevent the readhesion of the parts, such as the suspension of lead or gutta-percha plates, or a series of drainage tubes by means of threads passed through the nose. These gave only indifferent results. Dilatation by means of Barnes' rubber bags was successful while the procedure was persisted in.

Championnière constructed a curved silver tube, which was passed from below upward, between the palate and pharynx, and held in place by arms which were attached to the third molars of the upper jaw. This device seems to have been worn with comfort, and to have

answered an excellent purpose. Before resorting to his tube, Championnière had passed a rubber band into each nostril and round the palate, in order to maintain permanent traction. This, however, was without avail.

A. H. Smith cauterized the cut surface by means of monochloroacetic acid, the idea being thus to establish a superficial slough which would maintain itself in position for sufficient time to allow the edges to granulate beneath. I think experience teaches us that in most cases recontraction is the most serious difficulty with which we have to contend. While, therefore, Smith's device is a most ingenious one, and was attended with success in the case reported, it is scarcely available when there is a large amount of cicatricial tissue. The attempt has been made to dissect out the cicatrix. The necessary result, however, of such a procedure is merely a re-formation of the same tissue.

The exceeding great deformity which characterizes these cases, together with the difficulty in dealing with them by ordinary procedures, naturally suggests the resort to some plastic operation. One of the most ingenious of these was that carried out by Lesser in a case in which the soft palate was adherent to the posterior pharyngeal wall, with the exception of a small portion in the median line. The portion of the palate not adherent to the pharyngeal wall was split into two plates, and the anterior of these divided in the median line by a longitudinal incision. The freshened surface of the posterior plate was then united to the angle between the two anterior flaps which had been formed by the preceding longitudinal incision. The adhesions between the velum and the posterior pharyngeal wall on either side were then divided, and each anterior flap was folded backward and upward over the raw surface thus formed, and sutured in this position. In this way the healthy mucous membrane covering the anterior face of the palate was made to face the raw surface on the posterior pharyngeal wall, and readhesion was thus prevented. While devices of this sort may be available in special cases, I think, as a rule, experience teaches us that a stricture here follows the same general law as stricture elsewhere, and demands constant attention to preserve a sufficient degree of patency for ordinary functional purposes. The ordinary rule of procedure, then, will be to separate the adhesions as far as possible by means of a properly curved or angular knife, after which the artificial opening is maintained by the daily introduction of such dilating instruments as may be best adapted for the individual case. In many cases in which the opening already exists, the whole treatment may consist in the use of dilating instruments, gradually increasing their size. As good an instrument, perhaps, as

we possess for dilating purposes is the ordinary flexible œsophageal bougie, which may be passed from above downward through the nose, or inserted through the mouth. The patients easily acquire sufficient dexterity to carry out this manipulation successfully.

When the stenosis is of such a character as to notably interfere with respiration, tracheotomy would be demanded, and should, as a rule, be promptly performed as soon as the indications are present.

CHAPTER LXVI.

TUBERCULOSIS OF THE FAUCES.

It would seem that a deposit of miliary tubercle in the mucous membrane of the respiratory apparatus assumes a peculiar virulence according as the seat of the deposit is in portions near to the outer world. Furthermore, the frequency with which these tuberculous deposits occur seems to be governed by the same rule. In other words, while pulmonary tuberculosis is responsible for over one-seventh of the annual death rate among civilized nations, tuberculosis of the larynx is still less frequently met with, and tuberculous deposit in the buccal cavity is among the exceedingly rare manifestations of this fatal disease; but strange to say, while the frequency with which tuberculosis occurs diminishes in a marked way as we approach the outer world, it is also a noticeable fact that the severity of the disease increases.

Etiology.—The primary cause of faucial tuberculosis is the same as that of pulmonary or general tuberculosis. This subject, however, need not be entered upon in the present consideration. The active cause of the tuberculous manifestation in this region, undoubtedly, in the very large majority of instances, lies in a previously existing involvement of the pulmonary tissues. It has always been a subject of discussion, in connection with laryngeal phthisis, as to whether the primary deposit may occur in this region before the lungs are involved. The same question, of course, arises in connection with the pharyngeal affection, but from a practical point of view it is not important. That we may have a primary deposit of tubercle in the fauces, I think, should not be questioned. Primary tuberculosis may occur in any region or organ of the body; there is no reason whatever why it should not occur in the fauces.

From a clinical point of view, however, I think it is exceedingly probable that coincident with the faucial deposit there occurs a pulmonary infiltration. A number of these cases has come under my own observation. In one reported it seemed to be pretty clearly evident that the miliary deposit occurred in the pharynx, larynx, and lungs at about the same time. There was no autopsy in this case.

The symptoms, however, pointed toward a general tuberculosis. The clinical history, furthermore, of the large majority of the cases reported is of a similar character.

I think, then, we are justified in regarding faucial tuberculosis as a manifestation of acute miliary tuberculosis, the deposit occurring simultaneously in the pharynx, larynx, and lungs, together with the intestines and other portions of the body. Hence, a tuberculous ulceration in the pharynx or fauces should, as a rule, be accepted as evidence of general tuberculosis, the fact of the general systemic involvement being evidenced at the onset of the disease only by the marked constitutional symptoms, which, as will be seen later, are of a somewhat aggravated character. Furthermore, if physical signs give no evidence of involvement of other organs at the onset, or the bacillus is not found in the sputa, these manifest themselves so soon after the recognition of the faucial disease as to warrant the conclusion that a tuberculous infiltration has occurred simultaneously or immediately following the deposit in the tissues of the fauces.

In the majority of instances the disease sets in in the course of a chronic pulmonary tuberculosis.

While a question, perhaps, of no great practical importance, it has always been a subject of more or less discussion as to why tuberculous ulcerations develop in the throat.

Five cases of this disease have come under my own observation.

In two of them it was exceedingly interesting to watch the new deposit of tubercle, which could be clearly seen making its appearance in small grayish-white nodules beneath the superficial layer of the mucous membrane, in such a way as to demonstrate conclusively to my own mind that the tuberculous deposit occurred before the erosion or ulcerative process. These minute nodules, furthermore, were easily identified and their clinical history traced, as in the course of from three to five days they broke down and showed ulcerative action.

Strassmann's investigations possess a peculiar interest in this connection. He made a careful examination of the tonsils in 21 cases of tuberculosis; in 15 of these cases the tuberculous process involved the lungs; out of these 15 cases of pulmonary disease 13 showed tuberculous deposits in the tonsils. In 6 cases of tuberculosis the lungs were not involved, and in all these cases the tonsils were not tuberculous; although subsequently 2 developed pulmonary disease. In the 13 cases of tuberculosis of the tonsil the source of the trouble was undoubtedly in auto-inoculation from the pulmonary discharges. The possibility of this is therefore proven as regards the tonsil. The entanglement of tubercle baccilli here, I take it, was largely mechanical. The tuberculous process, however, in these organs in all

cases remained latent, no ulcerative action developing. This lends notable weight to the assertion already made that tuberculous ulceration in the fauces is a manifestation of acute tuberculosis, and not of the chronic form of the disease.

In view of the later pathological researches, we are compelled to recognize the fact that tuberculous disease is contagious.

Pathology.—The pathological changes which characterize this disease in the fauces differ in no essential degree from tuberculous processes in other portions of the air tract.

Of course the existence of the bacillus is recognized as an invariable accompaniment of a tuberculous process. The primary deposit in the majority of instances occurs in the velum in the shape of minute gray nodules, showing through the surface and causing slight grayish-white projections—the tuberculous nodule. These break down and form minute points of ulceration whose edges extend and join with their fellows, forming broad surfaces of diseased action. The extension of the disease is lateral to the pillars of the fauces and toward the pharyngeal walls. When the pharynx is the primary seat of deposit, the ulceration shows a certain amount of hesitancy in ascending to the soft palate and pillars above. The ulcerative action commencing in the tonsil is very rare, and, furthermore, these tissues are not readily involved in the morbid process commencing elsewhere.

In probably the large majority of cases the larynx is invaded by the tuberculous disease, if not coincident with, certainly very soon after, the faucial tissues are attacked.

Symptomatology.—The onset of the attack is marked by the symptoms of ordinary sore throat; there is a sharp, lancinating pain in the fauces, aggravated on deglutition; the parts feel sore and stiff, while at the same time the patient experiences a feeling of general malaise, with chilly sensations, or there may be a well-developed chill. Very early in the attack the thermometer shows a temperature of from 102° to 104° F., with the evening exacerbation characteristic of hectic fever. Deglutition becomes not only more painful, but is accomplished with considerable difficulty. The infiltration of the palate destroys its contractility in such a way that food and drink pass into the nasal cavities; at the same time the general symptoms develop, the hectic sets in, the fever becomes more persistent, and there is progressive loss of flesh, both as a result of the constitutional disturbance and the difficulty of taking nourishment. The movements of the palate in the act of deglutition being thus hampered, the mucous and muco-purulent secretions from the ulcers accumulate in the fauces, and are expelled with great effort, increasing the distress of the patient, who makes ineffectual attempts at clearing the

parts by a feeble effort of hawking. The voice is thick and muffled, and articulation becomes difficult owing to the immobility of the fauces. The tone of the voice is not notably impaired unless the larynx is invaded. Cough is somewhat persistent, feeble, and ineffectual. The secretions from the ulcer are thick and exceedingly tenacious, adhering closely to the parts. These inspissated plugs, as it were, stretching from one side of the faucial bridge to the other, give rise to obstruction to breathing and also to a sort of gurgling noise on inspiration.

After the faucial ulcerations are fully developed, these cases present a picture of suffering and distress that is pitiable in the extreme.

Practically, then, we find that the general symptoms are those of acute miliary tuberculosis in connection with the local symptoms due to the ulceration in the throat.

In rare instances tuberculosis in the fauces occurs in connection with chronic tuberculosis, when we find the same localized symptoms in the fauces, but not the marked systemic disturbance which characterizes acute miliary tuberculosis. These cases run a much slower course, and the clinical history, aside from the locality of the ulceration, is mainly that of tuberculous laryngitis.

Diagnosis.—Von Ziemssen in the discussion of laryngeal phthisis makes the assertion that neither the catarrh nor the ulceration of phthisical subjects presents any characteristic signs by which it can be recognized as such—a view which seems to have been adopted by Vivian Poore, Cohen, and others. Nothwithstanding this, I believe that phthisical ulceration, whether observed in the larynx or fauces, presents certain features which are so characteristic of this form of disease that, practically, a diagnosis should not present any very great difficulties, especially when, as is the case in the fauces, the ulcerative process can be brought under direct ocular inspection.

In the fauces two stages of the disease may be recognized: first, the stage of primary deposit, and second, the stage of fully developed ulcerative action.

The two conditions need no further description here. Practically, there is but one disease with which phthisical ulceration may be confused, and that is the superficial or deep ulceration of syphilis. It is not necessary to give the points in the differential diagnosis; for this may be settled by the determination of the presence or absence of the Koch bacillus.

Course and Prognosis.—As before suggested, I think we must regard tuberculous disease of the fauces, in the majority of instances, as a local manifestation of general tuberculosis, in which case it will necessarily result in a fatal termination in the course of a very few

months. When it occurs in connection with chronic pulmonary disease, the prognosis is almost equally grave, although the fatal termination is postponed somewhat. In this connection we consider it largely as a grave complication of the pulmonary disease, and one which adds notably to the suffering of the patient.

Confining ourselves, then, to the consideration of the local disease in the fauces, the question arises whether this is amenable to treatment. If, in a given case of pulmonary tuberculosis with faucial ulceration, the latter complication is cured, and the patient subsequently dies of the pulmonary disease, I think it is a justifiable assertion to state that the pharyngeal tuberculosis was cured. Gougenheim reports the case of a woman of twenty-five with an extensive ulceration of the soft palate and uvula, which was entirely cured by the regular application of iodoform and ether. The uvula was amputated and showed tuberculous tissue, although there is no report of the tubercle bacillus having been found. There was no pulmonary disease, and the recovery is reported as permanent. Lennox Browne reports an instance in which a small ulceration appeared on the tonsil in a patient suffering with pulmonary and laryngeal phthisis. It disappeared after a single application of the galvano-cautery. Heryng reports three cases of faucial tuberculosis occurring in adult life, in which the disease was a complication of pulmonary phthisis. The larynx was ultimately invaded in all these cases. The tuberculous ulcer was small and circumscribed, and was located on the pharyngeal wall. It was entirely cured by Heryng's method of curetting and subsequently rubbing in lactic acid.

We must accept, therefore, the teaching that in certain instances the small tuberculous ulcers in the pharynx which occur in connection with pulmonary disease may be amenable to treatment. In those cases in which the localized process is extensive in character, the prognosis is essentially unfavorable as regards even a slight amelioration of the local morbid action. In five cases reported children of from three to five and a half years were attacked and a fatal termination occurred in from two to eight weeks after the first manifestation of the faucial disease. The majority of the cases reported occurred in adult life. In those in which the disease complicated a recognized acute miliary tuberculosis, the fatal termination ensued upon the pharyngeal manifestation in periods varying from two to four months; while in those cases which simply complicated pulmonary phthisis the duration of life after the occurrence of the faucial deposit rarely exceeded six months, except those cases already mentioned in which the faucial disease was cured.

Treatment.—Up to within comparatively recent years, practically

the treatment of all forms of ulcerative action, including tuberculous, syphilitic, and others, confined itself mainly to the use of caustics, especially the solid stick of nitrate of silver, a proceeding not only useless but painful and distressing to the patient.

The natural reaction which followed the abandonment of the use of caustics led to an entirely opposite mode of treatment, which confined itself to the use of mild palliative and soothing remedies. These consisted mainly in the application of certain cleansing lotions to remove the mucous accumulations on the surface of the ulcer, after which there were applied mild, unirritating astringents, sedatives, and alteratives. The importance of this mild plan of treatment was first emphasized, so far as I know, in an article by the writer on laryngeal phthisis, in which the success was shown by a series of reported cases.

The plan, definitely outlined, consisted of four steps, as follows: First, the thorough cleansing of the ulcerated surface; second, the application of a mild astringent; third, the application of an anodyne; and fourth, the application of iodoform, for its specific action in controlling an ulcerative process. The cleansing is accomplished by the use of a carbolized alkaline solution. Dobell's solution answers an excellent purpose. This is applied in all cases by means of an atomizer. The second step consists in the application of an astringent. In the order of preference these are:

Zinci sulphas, ...	gr. v.	to the oz.
Argenti nitras, ...	" iii.	"
Zinci chloridum, ...	" iii.	"

The third step consists in the application of morphine in powder or in the form of Magendie's solution. The fourth step consists in the application of iodoform. This latter should be applied by means of Ely's powder blower. By this means a smooth, even layer of the powder is dusted upon the surface. This plan of treatment should be repeated every second or third day; if the case is an aggravated one, daily applications will be required. The surfaces of these ulcers are exquisitely sensitive to the touch; hence the above plan of treatment is carried out in such a way that the diseased tissue is in no way impinged upon by instruments of any kind. The solutions are applied in a state of fine atomization, and the powders blown upon the surface.

We find recorded in literature various recommendations for the use of inhalations by means of the steam atomizer or the ordinary inhaling apparatus which is used for volatilizing various medicinal preparations, such as oil of tar, iodine, creosote, benzoin, oil of eu-

calyptus, etc. I have never seen any advantage from the use of these measures in either pharyngeal or laryngeal tuberculosis; and, furthermore, I think as a rule that the steam or other hot applications are not well tolerated by a patient suffering in this way, in that it causes a certain amount of relaxation of tissues with increased secretion, as a result of which the local symptoms are liable to be to a certain extent aggravated. The pain in deglutition is always a very prominent feature of these cases; hence any measure which will enable a patient to swallow with comfort becomes of the utmost importance, as relieving suffering and at the same time serving to increase the amount of nourishment that can be taken. The local application of morphine adds very much to the accomplishment of this, perhaps; but we possess no remedy which accomplishes this end with the certainty and facility of cocaine. As increasing its permanency of action somewhat, it is well to apply this suspended in one of the fluid petroleum oils. An excellent formula is the following:

℞ Cocainæ hydrochloratis, ...	gr. xx.
Morphinæ, ...	gr. ij.
Aquæ, ...	ʒ ss.
Misce; ft. sol. Adde	
Ol. voschano	ʒ i.

This may be used at the hands of the patient or by an attendant several times during the day, as may be indicated.

While the above plan of treatment would seem to be largely palliative, yet in a number of instances, especially in laryngeal phthisis, I have seen notable results accomplished, not only in the retardation of the development of the local process, but in the marked improvement which occurred when the plan was faithfully and carefully carried out.

Krause has obtained excellent results in the treatment of tuberculous ulcerations in the larynx by the application of lactic acid, and his method consisted in rubbing the lactic acid thoroughly into the diseased surface by means of a cotton pledget, or by injecting it by means of a hypodermic syringe directly into the tissues. He commenced with a ten-per-cent solution, and gradually increased its strength if necessary up to eighty per cent, making daily applications until local necrosis occurred. Krause claims that lactic acid will cause the sloughing of the diseased tissue only, and that the healthy tissue is not acted upon by the acid. He has reported a series of cases of laryngeal phthisis in which this plan of treatment was followed either by cicatrization of the ulcer or by a marked improvement in the local condition. He reports no cases of faucial tuberculosis treated in this way. Heryng, however, reports two cases of the

pharyngeal disease treated by the lactic acid with entire success so far as the local conditions are concerned. Heryng's method differs from that of Krause in that the ulcerated surface is thoroughly curetted by means of a sharp spoon, thus removing as much of the diseased tissue as can be done in this manner, after which a strong solution of lactic acid is thoroughly rubbed into the tissues. In a third case by the same observer, an equally successful result followed the use of chloride of zinc in connection with lactic acid after the surface was curetted.

Heryng reports almost equally good results in the curette and lactic-acid treatment of laryngeal tuberculosis, having succeeded in obtaining complete cicatrization in eight out of twelve cases. All these patients died ultimately of the pulmonary disease, and yet the laryngeal manifestation remained cured for periods varying from two to seventeen months.

In another series of fifteen cases of laryngeal phthisis reported by Heryng, the treatment was by lactic acid alone, after Krause's method. Eleven of these were completely cured. The natural inference is that Heryng's curette does not add much to the success of the treatment, and that the remarkable results obtained were due entirely to the destructive action of the acid, in which we are compelled to recognize an agent which possesses peculiar powers in dealing with this most intractable disease, whether located in the pharynx or in the larynx.

While, therefore, I am of the opinion that in most cases of tuberculous ulceration the soothing and palliative plan of treatment outlined above will be demanded for the relief of local symptoms, I think we have not done our full duty to any patient suffering from this disease without giving him the benefit of such relief as lactic acid may afford, together with a hope of complete relief to the local conditions. I do not think that in resorting to the lactic acid we should abandon the other method. The methods are certainly not antagonistic, and I see no reason why in carrying out the milder course the more radical method with lactic acid should not be resorted to in those cases in which it can be used.

Koch's lymph, introduced in 1890, was hailed with enthusiasm, but the claims made for its powers of controlling a tuberculous process were greatly over-estimated, and it has not proved of the value expected.

Rosenberg reports a series of observations on fifty-seven cases of laryngeal phthisis, of which nine were cured by the use of menthol. He uses a twenty-per-cent solution of this drug in olive oil, applying it to the ulcerated surface once or twice daily. The application is

made by dropping a few drops on the diseased surface by means of a small syringe, or it may be applied with an atomizer. In addition to this the patient is directed to inhale a few drops of the same solution volatilized by boiling water, repeated several times in the course of the day.

Knight reports having made somewhat extensive use of Rosenberg's method, and, while reporting no cures, he finds it gives notable relief to the distressing symptoms of the disease.

A case of Gougenheim's seems to have been cured by a saturated ethereal solution of iodoform. Ether is very irritating to the air passages; and while regarding iodoform as an exceedingly valuable application in these cases, I think it should always be used in the form of a dry powder.

There are certain other measures which are of importance, not so much for limiting the progress of the disease as for alleviating the distressing symptoms. These consist in the regulation of the character of the food and method by which it is taken. Special apparatus has been devised for the artificial feeding of patients suffering from throat tuberculosis. We need not resort to these, however, for in my experience, if the ulcerated surface be thoroughly cleansed by means of an alkaline spray and a five or ten per cent solution of cocaine thoroughly applied, it is rare to meet with a case of throat phthisis in which deglutition is not accomplished painlessly and effectively. This anæsthesia persists usually from ten to twelve minutes, and can be repeated as often as it is desirable to administer food, which in these cases usually should be five or six times daily.

The general treatment of tuberculosis does not demand full consideration in this connection. The constitutional treatment of throat consumption is practically the same as that of pulmonary consumption. This is so familiar to all that its discussion need not be entered upon here.

CHAPTER LXVII.

LUPUS OF THE FAUCES.

In former years lupus was regarded as a disease which, under its two forms of *lupus exedens* and *lupus non-exedens*, confined its ravages almost exclusively to the skin, except in those instances in which the morbid process invaded the nasal cavities by extension. The possibility of its developing primarily or independently in the air tract seems to have been overlooked, and those cases in which the cutaneous affection was accompanied by ulcerative disease of the fauces or larynx were regarded, especially by the French writers, as instances of strumous ulceration. Rayer was one of the earliest to suggest that the morbid process in the skin and the mucous membrane of the fauces were identical in character—a view in which he was followed by Hamilton, Cazenave, Alibert, and Devergie.

Lupus, then, is a term which we use to describe a morbid condition which, while in the large majority of cases it attacks the skin, may also invade, either primarily or secondarily, the mucous membrane of the nose, pharynx, or larynx.

Etiology.—It is difficult to assign any actively exciting cause for the disease. In certain cases of the skin affection, traumatism seems to have been the active cause of its primary development, and the disease of the air tract to have arisen secondarily to the cutaneous affection. In those rare instances in which the disease is primary in the fauces, no exciting cause can be suggested.

Heredity does not seem to influence the disease, although undoubtedly a constitutional condition which bears some relation to the tuberculous diathesis plays an important part in its causation. It is a generally accepted teaching at the present day that the special morbid lesion which constitutes lupus is due to a tuberculous deposit which is practically identical with that which gives rise to tuberculous disease of other organs. In one case, however, the morbid process is an active one, while in lupus the morbid process which the tubercle excites is an exceedingly chronic or latent one.

In seventy-nine cases in which lupus has invaded the air tract, which I have collated from medical literature, including those which

have been under my own observation, fifty-one occurred in females, while but eighteen occured in male patients, the sex not being reported in the other instances.

As before stated, in the majority of cases the disease commences in the integument, and subsequently, at periods varying from one to ten or twenty years, invades either the fauces by new centres of development, or the nasal cavities, by continuity of tissue. When it extends to the fauces, it usually attacks the soft palate and pharynx first, and subsequently the larynx.

The relationship between lupus and tuberculosis seems to be clearly established, both from a clinical and pathological point of view; for while the two diseases appear to pursue a distinctly different course, they are coincident in the same individual in such a number of cases that this clinical relation must be accepted. This teaching, however, does not seem to be borne out by a study of the cases of lupus in the air tract, for of these I find but one instance in which lupus of the throat occurred in a tuberculous subject, viz., that reported by Thoma. In compilations of cases, Bloch finds a tuberculous taint in over seventy-five per cent of his cases, Raudnitz in nine per cent, and Besnier in twenty per cent. It is not easy to harmonize these statement. It is probable, however, that Bloch has accepted, as evidence of tuberculous disease, enlarged lymphatic glands, caries, and other manifestations which are usually grouped under the indefinite term struma.

While, therefore, the relation between the diseases seems clearly established from a clinical and pathological point of view, tuberculous disease of the lungs or other organs cannot be regarded as standing in a very active causative relation to lupus in the air passages.

Pathology.—The opinion broached by Neisser and Friedlander in 1881 that lupus constituted a true tuberculous process was very soon verified by the announcement of Koch that he had discovered the presence of the tubercle bacillus in lupus nodules. This view was still further confirmed by the experiments of Schuller, Doutrelepont, Koch, and others, who produced tuberculosis in the lower animals by inoculation of lupus tissue. Koch went still further, and produced pure cultures of tubercle bacilli from tissues invaded by lupus.

The most common point of invasion of the disease when it attacks the fauces is the soft palate or one of the pillars. It usually starts near the free edge. A very common point of origin is in the body of the uvula.

After the primary invasion, it extends slowly to neighboring tissues, without reference to anatomical boundaries, in this respect differing notably from syphilitic disease. From the soft palate it

extends to the pillars, involving the tonsils and finally the posterior wall of the pharynx.

At the onset of the disease it seems to be one purely of infiltration, producing that peculiar nodular thickening of the parts by which their normal contour is destroyed. The uvula is transformed into a thick, lumpy, bulbous mass, while the thin border of the soft palate is converted into a broad, somewhat ragged-looking, cord-like margin.

In connection with the infiltration which takes place in the tissues of the palate and pillars, there soon sets in a process of ulceration, which results in a notable loss of tissue. The ulcerative process which characterizes lupus is a peculiar one, differing in a marked degree from every other form of ulcer. There is an enormous thickening of the part from the primary and progressive infiltration, together with a slowly progressive recession or fading away of tissue; and yet the secretion is exceedingly limited, there is no pus discharge, no cell proliferation, no detritus, no necrotic tissue, and on close inspection in many instances a true ulcerated surface is not easily detected. In fact, none of the appearances which we ordinarily regard as characteristic of ulcerative action are present. This peculiarity may possibly be accounted for by the exceedingly chronic course of the disease, months and even years oftentimes being expended in the process of destruction of the soft palate and pillars.

There is also evident an apparently vigorous effort on the part of nature to repair the ravages of the disease, in that large bands of cicatricial tissue are prominently observable traversing the diseased surface. Their contraction serves in a notable degree to enhance the distortion to which the morbid process gives rise.

The diseased action is rarely symmetrical, being usually more active on one side than the other. The ultimate result is to produce a more or less complete destruction of the soft palate and uvula, while the two pillars are practically obliterated, and the remains of the palate are drawn down and adhere laterally to the posterior wall of the pharynx, being drawn to one side or the other, leaving a narrow opening into the naso-pharynx. When the posterior wall of the pharynx is involved, the destruction of tissue is not so apparent as the distortion of the parts. The faucial arch is narrowed by contractions, and the smooth surface of the pharyngeal membrane replaced by small knob-like projections here and there, marked by small points or lines of ulcerative action and traversed here and there by bands of connective tissue.

While the essential lesion in this disease is a tuberculous infiltration identical with that which gives rise to tuberculous disease of the

lungs, and while it is produced by the same bacillus, the two diseases run different courses. As before stated, a certain clinical and pathological relation is established between lupus and tuberculosis. The former disease has been reported by many as a chronic and latent form of tuberculosis; thus, it would seem that lupus bears the same relation to chronic tuberculosis as chronic tuberculosis does to the acute form. And yet, while both lupus and tuberculosis may be coincident in the same individual, no case, so far as I know, has ever been observed in which lupus was transformed into an ordinary tuberculous process. Attempts have been made to explain this "latency" and "chronicity" of tubercle in lupus on certain anatomical peculiarities of the skin, but the arguments all fail completely when we transfer lupus to the mucous membrane of the air tract, a region most favorable for the development of a tuberculous process, in that here we find it presenting the same latency and chronicity which characterized its progress in the integument. While, therefore, the microscope has revealed the identity of the morbid process and the identity of the bacillus in the two diseases, the true explanation of the cause of the marked difference in the clinical history has yet to be determined.

The pathological changes which characterize the disease in the fauces differ in no essential degree from those already described in the chapter on lupus of the nose.

Symptomatology.—An invasion of the upper air tract by lupus is exceedingly insidious, and makes itself manifest at the onset by no appreciable subjective symptoms. The later symptoms are generally those found in the later stages of tubercular and syphilitic ulceration.

Diagnosis.—The marked chronicity of the process in lupus, together with the unusual form which the ulcerative action takes on, with the gross appearance of the disease on ocular inspection form a condition which should be mistaken for no other disease.

The onset of lupus is characterized by an infiltration of the mucous membrane by tubercle. This occurs in the form of small nodules, so that, in place of a diffuse and uniform thickening of the tissue, we have the disease marked by irregular and rounded elevations. This may involve at first but a limited area, but, by a slow process of extension, it gradually involves, more or less completely, the soft palate, faucial pillars, and the pharyngeal wall. On gross inspection, we find the membrane presenting this nodulated outline. This is more prominent in some places than others, but the smooth contour of the mucous surface is completely obliterated wherever the diseased process has extended.

When ulceration sets in, this process occurs only in exceedingly

limited areas, and is not usually recognized by any purulent discharge or yellow ulcerated surface. It occurs in small spots, lines, or fissures, and the surface presents a reddish, velvety aspect which can only be recognized as a truly ulcerative process by careful inspection. Comparatively early after the onset of the attack, the vigorous efforts at repair on the part of nature are evidenced by the appearance of granulating surfaces, which subsequently are converted into bands of connective tissue, forming more or less extensive cicatrices. After the disease has persisted for some time, these cicatricial bands, traversing the surface of the diseased tissue, become a prominent feature on ocular inspection.

The diseased surface is highly injected, and presents a deep red color, of a somewhat sombre and dusky hue, in marked contradistinction from that which attends an acute inflammatory process, and yet of a lighter color, as a rule, than that which we meet with in syphilitic disease. The mucous membrane surrounding the diseased process is usually perfectly normal in aspect, although occasionally slightly injected owing to the mechanical interference with the return venous circulation by the cicatricial deposit, or in consequence of the distortion of the healthy parts as the result of their contractions.

The disease need not be confounded with tuberculosis, because the latter affection is characterized by marked anæmia of the surrounding membrane, with a pale, grayish, ulcerative process, which is distinctly and easily recognized as a progressive destruction of tissue. A tuberculous ulcer, furthermore, is usually covered by a thick, ropy, tenacious mucus or muco-pus, in all these points differing strikingly from lupus, in which there is marked hyperæmia and almost total absence of secretion, while the ulcerated surface is almost identical in color with the non-ulcerated parts. Furthermore, the tuberculous cachexia is almost invariably present in a marked degree in tuberculous disease of the upper air passages, while in lupus the general health is not affected.

The only form of syphilis with which it may be confounded is the tertiary ulcer.

In malignant disease we have a well-marked tumor, projecting into and encroaching upon the air tract, in contradistinction to the somewhat diffuse infiltration of the mucous membrane which characterizes lupus.

In either case the patient should be placed under antispecific remedies, which in a case of lupus would not only fail to improve the aspect of the disease, but in most instances probably would aggravate it, and in malignant disease would soon enable us to make the diagnosis.

Course and Prognosis.—As we have already seen, in the large majority of instances lupus of the air passages is secondary to cutaneous lupus. That the faucial disease is to be considered an exceedingly grave complication of the cutaneous lesion cannot be questioned, it involves no little discomfort, impairment of function, and suffering; and yet the prognosis of lupus, whether of the air tract or of the integument, is not usually to be regarded as a grave one, for it very rarely terminates fatally. Invasion of the air tract, moreover, seems to add but little to the gravity of the disease, nor does it ever take on renewed activity in these parts, maintaining rather the same great chronicity which characterizes its progress as a cutaneous affection.

While the presence of the disease in the fauces involves merely a certain amount of discomfort, with impairment of function, the real gravity which attaches to it is the danger of the laryngeal invasion. Aside from a case reported by Landrieux, I know of no fatal termination from faucial lupus.

The clinical history of these cases, as in cutaneous lupus, is marked by more or less prolonged periods of quiescence, during which the disease either ceases to advance or there may even be notable improvement. I know of no case of spontaneous cure of faucial lupus, although this occasionally occurs in the cutaneous disease. In a case reported by Cazin, the lupus of the fauces disappeared spontaneously after convalescence from erysipelas. The larynx, however, was not involved.

Treatment.—For convenience, we may divide the measures of treatment into topical applications, curetting, excision, internal medication, and injections of tuberculin.

Topical Applications.—The various local remedies which have been used with more or less success are: Nitrate of silver (one hundred and twenty to four hundred and eighty grains to the ounce), tincture of iodine, lactic acid (from twenty to eighty per cent solution), solution of the perchloride of iron (one hundred and twenty grains to the ounce), and the galvano-cautery.

Bowen reports the case of a male, aged thirty-nine, in which the faucial invasion, occurring six years after the cutaneous lesion, was cured by the application of a four hundred and eighty-grain solution of nitrate of silver, together with the subsequent use of perchloride of iron and iodoform. Ziemssen seems to have been equally successful with the solid stick of nitrate of silver, in a girl aged twelve, in whom the disease invaded the larynx primarily, there being no other lesion. The affection had lasted a number of years.

Asch reports the case of a female, aged eighteen, suffering with pharyngeal and laryngeal lupus, without cutaneous lesion, which was

practically cured in about twenty-two months by local applications of a four hundred and eighty-grain solution of nitrate of silver, together with the internal administration of five-drop doses of Fowler's solution, gradually increased to ten drops. In the latter part of the treatment a one hundred and twenty-grain solution of perchloride of iron was used, together with the internal administration of cod-liver oil.

Moure recommends the use of chromic acid, fused on the end of a slender probe.

The Curette.—The good results so frequently obtained by curetting in cutaneous lupus naturally suggest the resort to this measure in faucial invasions. Lupus of mucous membranes, however, seems to act differently from the same disease invading the integument and I find no records of notable success from this measure in the faucial disease. In the single case in which I have observed its use in the air tract, it seemed to have done more harm than good.

Excision.—When the disease is limited and the parts are accessible, there can be no question as regards the advisability of the excision of the morbid tissue. Browne very properly advises the amputation of the uvula when the disease invades this organ primarily. The same might be stated in regard to the free border of the palate or perhaps one of the pillars. The success of this resort necessarily depends upon the completeness with which the diseased membrane is excised. Hence this measure is probably available only when the disease is limited and confined to the soft palate or pillars, as its success would be somewhat problematical in the pharyngeal wall. Garre reports the case of a woman, aged twenty, in which the disease involved the base of the tongue, epiglottis, aryepiglottic folds, and arytenoids. It had lasted somewhat over a year. Local applications of lactic acid and iodoform were of no avail. Excision of the epiglottis also failed to arrest the disease, and he finally performed subhyoid pharyngotomy and excised all the morbid tissue. The procedure seems a somewhat daring one, and yet his success seems fully to have warranted it, for at the end of five months there was no recurrence of the disease.

Internal Medication.—Local treatment, of course, should be in all cases combined with internal medication. The remedies which seem to have given the best results are cod-liver oil, arsenic, and iron. In those cases in which the disease has been arrested, it is perhaps difficult to estimate whether the favorable result has been due to the local applications or to the internal medication. A careful reading of cases, however, carries the conviction that internal medication has played an exceedingly important part in controlling the diseased

action. Whether in the form of arseniate of sodium or in the form of Fowler's solution, arsenic certainly seems to possess a somewhat specific action in the control of lupus, and our whole duty is probably done in no case without fully testing its efficacy. Its action, moreover, seems to be aided by the coincident administration of cod-liver oil and general tonics according to indications.

Tuberculin.—In regard to the injection of Koch's lymph for the control of lupus, while a number of cases seem to have been temporarily improved and the disease apparently arrested perhaps, so far as I know, there is no well-authenticated case of lupus, either of the skin or air tract, which has been permanently cured by this measure. The same should be stated in regard to the cantharidate of potash, as advocated by Liebreich.

CHAPTER LXVIII.

FOREIGN BODIES IN THE FAUCES.

Our main consideration in this chapter is the subject of foreign bodies in the pharynx, although occasionally we find small bodies, such as pins, needles, fish-bones, etc., lodging in the faucial or lingual tonsils, and sometimes piercing the soft palate or pillars.

The pharynx being a large, open, and easily accessible cavity, the natural inference would be that not only might the presence of a foreign body in this region be easily detected, but also that it might be extracted without great difficulty; and yet it is by no means rare that cases of this sort present notable difficulties, not only in directly locating the body, but also in devising some successful method for its removal.

Among the most common objects which lodge in the fauces are small fish bones taken in with the food. They are exceedingly liable to become embedded in the spongy tissue of the lingual or faucial tonsils, where, on account of their color and diminutive size, it is not always easy to detect their location. They make their appearance known by the prickling pain which occurs with the act of deglutition; and the patients, moreover, find it by no means easy to distinctly locate this pain.

Next in frequency after the lingual we find the small bones embedded in the faucial tonsil, the pyriform sinuses, the posterior pharyngeal wall, or the orifice of the œsophagus.

The search for them should always be made with the best light, sunlight being used if possible; when located, they are easily extracted by means of properly curved forceps, using direct or reflected light as may be necessary.

Pins, needles, and sharp objects of that sort form another class which make their way frequently into the fauces.

These small sharp bodies, while giving rise to distressing symptoms at the time, ordinarily involve no grave danger, although deaths have been known to occur.

They usually give rise to pain on movement of the pharynx, with certain reflex disturbances, such as cough, retching, etc. If they remain a sufficiently long time, they may cause inflammation and

suppuration, or, piercing the tissues, they may become encysted. Frequently they migrate even without giving rise to any notable symptoms, penetrate the tissues of the neck, and finally emerge, with or without suppuration, beneath the skin.

If the object be sufficiently sharp, it may make its way to the skin without exciting a suppurative process, although, as the object approaches the skin, abscess formation is likely to occur, as in the case reported by Thevenot, in which a fish bone, migrating from the fauces, gave rise to a subcutaneous abscess extending from the angle of the jaw to the chin. Dunbar reports a case of a pin, two and one-quarter inches long, remaining embedded in the pharynx eleven months, giving rise to pain, cough, expectoration, etc. It was finally expelled voluntarily, in two pieces.

In a case recently seen by the author, a young girl, holding in her mouth a bonnet pin five inches in length, had fallen upon her face, driving the pin directly back through the palate, and embedding its point in one of the vetebræ. Considerable force was necessary to extract it, and yet no unpleasant symptoms followed.

Grave operative interference is rarely demanded in the case of these pins, needles, etc., and yet Wheeler reports an instance of a man aged forty-five having swallowed a threaded needle, which was lodged in the fauces in such a way that the left posterior palatal fold was transfixed while its point was inserted into the left arytenoid. It was so firmly fixed in its position that lateral pharyngotomy was performed for its removal.

Living objects in the fauces would seem to be a rare accident, yet cases are on record of such occurrences.

Smooth, rounded bodies, such as coins, medals, buttons, nuts, marbles, etc., when they make their way into the fauces, usually pass into the œsophagus, lodging at the prominence of the cricoid cartilage, or at the lower end of the œsophagus, or they may pass into the stomach. When these bodies fail to enter the œsophagus, they are usually found projecting from its orifice, or else in the pyriform sinuses. The symptoms to which bodies lodged here give rise are usually dysphagia, cough, expectoration, and some loss of voice, according as the larynx may be involved, together with certain reflex disturbances, such as convulsive movements of the fauces, while in young children general convusions may ensue. The interference with deglutition necessarily results in impaired nutrition, with loss of flesh.

The location of a foreign body of this kind is based not only on inspection by direct and reflected light, but also on exploration of the parts by means of the index finger. If the patient is young, external manipulation may be of service; ordinarily, however, the removal of

these objects is accomplished with comparative ease by means of a properly curved forceps, which is manipulated with the aid of the laryngeal mirror, or, better still, I think, as a rule, by means of the index finger of the left hand. The administration of an anæsthetic is rarely necessary, except in very young children, for, whereas in the œsophagus the use of ether or chloroform is necessary in order to produce relaxation of muscular spasm, a foreign body in the pharynx or mouth of the œsophagus is not ordinarily held with sufficient force to interfere with its extraction. When the body can be reached and located by means of the index finger, it is comparatively rare that it cannot also, with equal facility, be seized and removed by means of the forceps. Of course, in exploring the fauces by means of the finger, retching and even vomiting is liable to be excited, and the object expelled thereby. This is probably a better method of producing emesis than the administration of drugs.

Impaction of these bodies in the fauces is comparatively rare, and yet when it does occur it is liable to give rise to inflammation and subsequent pus formation.

We have thus endeavored to group, to a certain extent, the commoner objects which we are called upon to remove from the fauces. Any attempt at further classification would be useless, in that the number and variety of objects which are met with here are endless.

The dropping of false teeth into the pharynx during sleep is by no means an uncommon accident, many such case having been reported. In one it happened during the administration of an anæsthetic, in another as the result of a fall. The symptoms are usually pain in the throat and dysphagia, with more or less dyspnœa, according to the size and location of the plate. In a case of Paget's the plate was lodged in the glosso-epiglottic fossa, and was the unrecognized cause of pain on swallowing and progressive emaciation for nearly four months. In one reported by Carlyle the teeth remained in the pharynx ten hours, giving rise to no symptoms other than slight impairment of phonation. A patient of Pollock's died from suffocation immediately upon the occurrence of the accident. I find no other fatal case reported, although one patient died after an external pharyngotomy—an operation which was done also in two of Cock's cases, although in most instances the plate is removed with comparative ease by means of the forceps.

Instances of the swallowing of large and irregular pieces of bone taken in the food are exceedingly common, and their presence frequently constitutes a condition of no little gravity, on account of the difficulty of their removal and the dyspnœic symptoms which are very liable to occur.

CHAPTER LXIX.

NEUROSES OF THE FAUCES.

The great activity and diversity of function which characterize the parts in the faucial region, naturally demand an unusually rich nerve supply. Hence, we expect to find this region the seat of numerous disturbances of a neurotic character. As a matter of clinical observation, however, I am disposed to think that genuine neuroses involving the organs of the fauces are comparatively rare. For the present consideration they may be classified as follows:

1. Abnormalities of sensation.
2. Neuralgias.
3. Reflex neuroses.
4. Spasmodic disturbances or chorea.
5. Myopathic paralysis.
6. Bulbar paralysis, or paralyses due to central lesion.

Abnormalities of Sensation.

Cohen thinks that both hyperæsthesia and anæsthesia may occur as independent affections involving the palate as well as the pharynx. Paræsthesia is described by A. H. Smith, Fr. Knight and others, as a perverted sensation of tingling, prickling, or as of a foreign body in the fauces. These cases, however, in the large majority of instances are due to the presence of enlarged glands in the glosso-epiglottic fossæ, to distended tonsillar crypts, or to some other local organic change.

In my own experience, I have seen no case in which the local conditions were such as to demand topical remedies. The condition is one which must be corrected by the administration of general tonics.

Neuralgia.

A sore throat with little if any inflammatory lesion is a matter of frequent observation. Moreover, it is exceedingly difficult, oftentimes, to definitely locate the source of a painful symptom referable

to the fauces. Many of these cases, therefore, we are compelled to classify as neuralgic. They usually occur in nervous and hysterical women, and are simply local manifestations of a general condition. In other cases we frequently meet with neuralgic pains in connection with chronic follicular pharyngitis, as has been already observed in the discussion of that affection. This is particularly true in connection with pharyngitis lateralis.

The source of the pain is probably either in the terminal filaments, or small branches of the glosso-pharyngeal, and here also the indications for treatment are the administration of iron, quinine, and general tonics for the correction of the systemic condition. Topical remedies are of no avail. It is of the utmost importance, however, to thoroughly investigate the condition of both the lower and upper pharynx, together with the tonsils and the glands at the base of the tongue, for I am confident that many cases of faucial pain may be traced to a morbid condition of some of the lymphatic bodies in this region, such as the faucial and lingual tonsil, etc., or the existence of imprisoned secretions, or some other local cause. I do not think that local lesions give rise to neuralgia, except when the general system also is at fault. The internal administration of quinine, iron, general tonics, etc., is therefore probably indicated in every case.

Reflex Neuroses.

Various reflex disturbances, due to the presence of enlarged tonsils, are frequently reported, such as cough, aural pain, nightmare, gastric disorders, etc. I do not think these should be regarded as purely reflex disturbances, for they are oftentimes symptomatic of the tonsillar disease. In the same category the pharyngeal irritation described by Harrison Allen may be placed. I see no reason why cough may not be directly symptomatic of pharyngeal disease.

Spasmodic Disturbances, or Chorea.

Abnormal muscular contractions, as involving the faucial region, are largely confined to the soft palate, and as a rule assume that peculiar character which from a clinical point of view is generally described under the designation of chorea, although the cases reported are usually defined as instances of clonic spasm of the palate, the term chorea not being used.

In the large majority of cases, the muscle which seems to be mainly involved is the levator palati; the soft palate is rapidly drawn up against the pharyngeal wall, and again released, and this move-

ment is repeated a number of times until the clonic spasm of the levator muscle ceases. Each contraction is accompanied by a curious clicking sound in the ear, which is noticed not only by the patient but by one standing near, which probably arises as the soft palate detaches itself from the pharynx after each contraction. The movements during their progress are of a somewhat rhythmic character, which is not only appreciated by the patient, but can be easily observed by ocular inspection of the fauces.

Tonic spasm of the palatal muscles proper never occurs, so far as I know, although Wagner states that in advanced stages of paralysis agitans movements of the soft palate may occur very similar to those of the muscles of the trunk or extremities. Spencer reports two cases of clonic spasm of the constrictor muscles of the pharynx, in which there were also similar movements of the eyeball, as well as of the arytenoid cartilages. These movements, moreover, were synchronous in all of the parts involved. The origin of the disease here was in a cerebral tumor.

In the cases in which the levator palati muscle alone was involved, the origin of the disease seemed to be quite as obscure as in instances of general chorea, and in most cases it is impossible to assign a definite cause to the occurrence of the disorder.

The prominent indication for treatment consists in the removal of any possible source of reflex disturbance, such as intranasal or pharyngeal disorders. We possess no drug which exercises a specific influence on choreic affections. Probably our most efficient remedy lies in the administration of some preparation of arsenic, in connection with general tonics and iron. In addition to this, of course, a certain amount of attention should be directed to the regulation of the diet, clothing, outdoor exercise, bathing, etc.

Myopathic Paralysis.

This term is one which has come into somewhat general use as describing a form of paralysis which is confined to individual muscles or groups of muscles. The name would seem to suggest that the true lesion lies in some morbid condition of the muscular fibres rather than in any defective innervation. This view is doubtless an error, in that the true pathological condition is probably some abnormality in the smaller nerve trunks or terminal fibres; and yet, the term "myopathic paralysis" being one of such general use, I do not feel at liberty to discard it.

As affecting the faucial region, we may have a paralysis involving a portion or all of the muscles which act upon the soft palate. The

paralysis may be unilateral or bilateral; or we may have it complete on one side and incomplete on the other, viz., a paralysis of one half of the palate with paresis of the other half.

It is often assumed that the occurrence of paralysis in the palate of a child is sufficient evidence of the diphtheritic character of a previously existing faucial inflammation. I think this view must be abandoned, and that we must accept not only the teaching that a myopathic paralysis may follow any form of inflammatory lesion in the fauces, but also that it may occur without any previously existing local affection. If we accept this view, it necessarily follows that the cause of these local paralyses is not in a localized lesion, but in a general blood condition.

In those cases in which the palate is paralyzed, the symptoms have reference mainly to the loss of function of this organ. Deglutition is somewhat impaired, and the food has a tendency to make its way into the nasal cavity. This is especially true of fluids. The prominent symptom, however, has reference to the voice, which is thick and decidedly nasal in character; articulation is exceedingly difficult, phonatory waves escaping into the nasal cavity. Whistling and puffing out the cheeks are impossible. Expectoration also is notably hampered; consequently there is a tendency to accumulation of mucus in the faucus, which the patient is unable to expel. These symptoms are quite marked when both sides of the palate are paralyzed. Occasionally, however, the paralysis is confined to one side, in which case, of course, the symptoms are somewhat modified.

An inspection of the parts easily reveals the condition. The palate and uvula hang down motionless and fail to respond to ordinary stimuli, such as the probe, etc. If one side only is involved, the uvula is notably drawn to the healthy side, while the pillar of the fauces and whole palate seem to be drawn down by the action of the palato-glossus and palato-pharyngeus muscles.

We occasionlly see cases, usually in adult life, in which there is a markedly paretic condition of the muscles of the fauces, mainly noticeable in the impairment of the act of deglutition. The bolus of food, reaching the pharyngeal cavity, is not seized with sufficient vigor to propel it into the œsophagus, nor can it be expelled into the mouth with ease. The result is an attack of choking, which is oftentimes a source of great distress to the patient, although rarely dangerous. In a series of cases of this sort reported by the writer, the symptoms simulated, in no small degree, that of stricture of the œsophagus. The diagnosis was based on the fact that the constrictor muscles of the pharynx responded very sluggishly to the impact of the probe, and, furthermore, sensibility was diminished, as decided

by the æsthesiometer. The disease occurred in individuals of impaired general health, and disappeared under the administration of general tonics, such as chalybeates and strychnine, and the application of the faradic current.

Practically, the same indications are present in the cases of complete paralysis following diphtheria and other diseases.

The faradic current here, I think, aids materially in hastening the cure of the disease, and should be administered by applying the sponge electrode to the back of the neck, while a small-pointed metallic electrode is pressed upon the faucial muscles consecutively.

The prognosis is always good in cases of so-called myopathic paralysis, although complete restoration may be delayed for weeks and even months, especially after severe cases of diphtheria.

Paralysis Due to Bulbar Lesion.

Under this heading we consider those forms of paralysis which are the result of a diseased condition of the medulla oblongata. This as we know, is not only an organ of nerve conduction, but it also contains within it nuclei which act as nerve centres, presiding over certain vital phenomena, such as respiration, cardiac inhibition, vasomotor control, deglutition, etc.

In the present consideration of faucial paralyses, we have to do mainly with the functions of articulation and deglutition.

Excluding those cases which we have already designated as myopathic paralyses, all cases of paralysis of muscles of the fauces must probably be traced to some central lesion in the medulla, with the exception of instances of paralysis of the levator palati and azygos uvulæ muscles, which derive their innervation from the facial. These latter muscles, therefore, may be the seat of a paralysis as the result of pressure on the nerve trunk. This is especially liable to occur where the facial nerve passes through the aquæductus Fallopii.

The lesions which may give rise to paralysis in the fauces are acute and chronic bulbar myelitis, hemorrhage, embolism, tumors, and basilar meningitis.

Up to comparatively recent times, all forms of paralysis due to disease of the medulla were described under the head of "progressive bulbar paralysis," indicating an essentially chronic affection. Later investigations have shown the existence of a similar disease running an acute course, while still later study has shown that embolism, apoplexy, and tumors in the medulla may be the source of the peculiar train of symptoms which characterizes bulbar disease.

Acute Bulbar Paralysis, or Acute Bulbar Myelitis.—This

form of paralysis running an acute course is an exceedingly rare event. Our attention was first called to it by Leyden, who reported in detail the clinical histories and results of autopsies in three cases which occurred respectively at the ages of thirty-six, fifty-two, and sixty-two, and terminated fatally at the end of from four to ten days. There were two females and one male.

The characteristic symptoms of the acute form of the disease are the suddeness of the invasion and the rapidity with which the paralysis develops. The patient is seized with headache, giddiness, and perhaps vomiting, together with general weakness and unsteadiness of gait. There is no loss of consciousness. The dysphagia increases, and articulation becomes thick and difficult. The movements of the tongue and lips show evidence of the progressive involvement of the bulbar nuclei which preside over the functions of articulation, respiration, and cardiac inhibition. The pulse also becomes small, rapid, and intermittent, and a fatal termination soon follows. Treatment is of little avail.

Chronic Bulbar Paralysis, or Chronic Bulbar Myelitis.—This affection was first described by Duchenne as a separate disease, under the name of "progressive muscular paralysis of the tongue, soft palate, and lips," although isolated instances of this affection had previously been reported by Bell, Trousseau, and Dumesnil. While Duchenne gives an admirable clinical description of the disease, its true pathological character remained obscure until Wachsmuth stated that the cause of the disease would be found in a morbid lesion of the medulla, and hence suggested that the disease be called "progressive bulbar paralysis." Later investigation not only confirmed Wachsmuth's theoretical suggestion, but also revealed the fact that the starting-point of the disease lay in certain degenerative changes in the bulbar nuclei, which led Kussmaul to propose the name of "progressive bulbo-nuclear paralysis."

We can assign no cause for the disease. That most frequently suggested is exposure to cold. It occurs more often in men than in women, and is essentially a disease of later life, occurring usually after the fourth decade.

The onset of the disease is ordinarily quite insidious, the first symptoms being a slight sensation of uneasiness in the back of the neck, with perhaps a little hesitancy of speech or articulation. This is soon followed by a slight difficulty in deglutition. In connection with this there is a certain diminution of reflex irritability of the mucous membrane of the pharynx. The impairment of deglutition is due primarily to paralysis of the palate, which also notably affects the vocal tones, giving rise to a nasal twang, with imperfect articula-

tion. Mastication is soon affected, mainly owing to the defective movements of the tongue in managing the bolus of food.

As a rule, the laryngeal symptoms are not very prominent. This seems a rather curious feature of the disease, and one not easily accounted for. In my own experience, in unilateral bulbar disease due to embolism, endarteritis, etc., when the larynx has been involved, it is usually a paralysis of abduction that is noticed. If the same rule obtained in Duchenne's disease, a bilateral paralysis of abduction would give rise to notable and distressing symptoms of dyspnœa, with recurrent attacks of spasm of the glottis. Again, when tabes has invaded the medulla, clinical experience teaches us that it is very liable to give rise to what has been termed laryngeal crises, which are due most frequently to bilateral paralysis of the abductors. Why this should not be more liable to occur in progressive bulbar paralysis, at first seems somewhat puzzling. Gowers states that, whereas paresis of the laryngeal muscles is quite common, "laryngeal palsy rarely becomes complete, and it is still rarer for the power of abduction to be specially lost." As we have already seen, the nucleus of the accessory nerve is invaded somewhat late in the disease. Hence, the fact that complete abductor paralysis does not occur can only be explained by the fact that death ensues before the sclerosis has fully destroyed the nuclei of the accessory nerve. Why these nuclei are so frequently destroyed in tabes and not in Duchenne's disease cannot be fully explained.

The prognosis in these cases is an exceedingly grave one, and death usually occurs in from one to five years after the manifestation of the first symptoms, no case of recovery having been recorded. Furthermore, the course of the disease is steadily progressive, any temporary arrest or amelioration of symptoms being an exceedingly rare event, the cause of death being either general inanition, or dyspnœa or heart failure.

Sudden or Apoplectiform Bulbar Paralysis.—This term is used to describe those cases of bulbar paralysis which, while coming on suddenly, are attended oftentimes with somewhat obscure and puzzling symptoms at the onset, and which therefore not infrequently present certain diagnostic difficulties. The term is used as a purely clinical one, for the reason that, while the train of symptoms which these cases present is very similar in character, the pathological lesions vary in different instances.

This is the form of bulbar paralysis, moreover, which is of special interest to the laryngologist, as the diagnosis must in a very large degree be based upon an inspection of the fauces. The recognition of the special bulbar lesion, however, is at best but a matter of opin-

ion based on a careful analysis of local and general symptoms, and as a rule is only clearly demonstrated upon a post-mortem examination.

We therefore include under this head cases of bulbar paralysis which are due to hemorrhage, embolism, endarteritis, softening, etc.

A prominent point for discussion, of course, in connection with this disease is the question of diagnosis. This is necessarily based on the existence of a paralysis coming on suddenly and involving muscular structures which receive their innervation from the ganglia which are located in the floor of the fourth ventricle. This paralysis may be unilateral or bilateral, depending upon the involvement of one or both sides of the bulb. It may confine itself to half the palate, as in a unique case reported by Dumesnil, or it may involve the movements of the larynx, pharynx, palate, and tongue, which are governed by the bulbar ganglia.

The attack comes on suddenly, and usually during sleeping hours. The patient awakens in the morning with a feeling of malaise, indisposition to move, dizziness, and perhaps headache, with vomiting; but his attention is first called to a condition of paralysis usually in the attempt to swallow, which is found to be either difficult or impossible. While there is no paralysis of the muscles of the extremities, their movements are, at the onset of an attack, very liable to be affected, probably as the result of some disturbance of the circulation in the anterior pyramids. This symptom, however, usually passes away after a time. If the muscles of the larynx are affected, the paralysis is usually complete of one or both sides, although a number of instances of simple abductor paralysis have been reported.

The extent of paralysis in this region can be determined only by laryngoscopic examination.

Paralysis of the palate and pharynx is usually made out on inspection of the parts and by stimulation with the probe. Unilateral paralysis is indicated by the drawing of the palate and uvula, with protrusion of the tongue, to the paralyzed side. Pain, with feeling of stiffness, perhaps, in the region of the nucha, while not a constant symptom, is not infrequently present at the commencement of the attack.

To clearly localize a lesion in the medulla, as the source of paralysis of faucial muscles, will not infrequently present a problem of some difficulty; and yet I am disposed to think that in the majority of cases the apoplectiform character of the attack, without loss of consciousness, the general motor disturbance, together with a careful analysis and study of the area of the paralytic invasion, will serve in most instances to make the diagnosis comparatively clear; certainly

a coincident invasion of the muscles of the tongue and pharynx, or of the muscles of the palate and larynx, would indicate a bulbar lesion.

The difficulty of diagnosis occurs in those exceedingly rare instances in which the paralytic area is but small in extent.

The prognosis of these cases is usually not essentially grave, in that the disease is not a progressive one, the whole mischief having been accomplished with the first seizure. In rare instances, however, an endarteritis, perhaps, or some other lesion, may set up changes which become progressive, and the disease may go on to a fatal termination.

The treatment of the affection, of course, is purely a treatment of symptoms. The measures to be pursued have already been sufficiently indicated in the discussion on the treatment of progressive bulbar paralysis.

Bulbar Paralysis Due to the Presence of Tumors, Meningitis, etc.—Cases in which faucial paralysis is the result of tumors in the medulla are exceedingly rare. When this occurs, however, it is not ordinarily a difficult matter to locate the lesion in the bulb, although, of course, the recognition of the special form of neoplasm is usually only determined by a post-mortem examination.

The symptoms develop somewhat slowly, and consist usually of some disturbance of vision, with perhaps dilatation of the pupils. There is headache and nausea, with motor and sensory disturbances in the fauces and perhaps other parts, dependent upon the size and location of the growth.

In a case reported by Joh. Erichsen, in connection with certain general symptoms there was paresis of the right side of the palate, loss of voice, and anæsthesia of the right side of the face, which an autopsy revealed to be the result of a tuberculous tumor in the floor of the fourth ventricle, the size of an almond, which covered the right half of the bulb, completely destroying the right restiform body.

In a case reported by Sokaloff, there was weakness of the right arm and leg, defective hearing, right facial paralysis, difficulty in deglutition, deviation of the tongue and uvula to the right, and paralysis of the left vocal cord. Dyspnœa occurred later in the disease. The autopsy revealed a glioma involving the left side of the pons, medulla, and olivary body.

McBride reports a case in which a carcinoma of the base of the skull gave rise to paralytic symptoms involving the hypoglossal and glosso-pharyngeal nerves of the left side, left abductor paralysis, and complete anæsthesia of the left half of the larynx.

Turner reports a case of a child, aged five, that suffered from difficulty in deglutition and from cough, together with unilateral atrophy of the tongue and paralysis of the soft palate and of the laryngeal muscles. There was also atrophy of the optic nerves, and a weakness and atrophy of the right arm. The history of hereditary syphilis in this case led to a diagnosis of syphilitic disease of the basilar meninges.

In a case reported by Nothnagel, an abscess, originating in the petrous portion of the temporal bone, gave rise to paralysis and atrophy of the left side of the palate, anæsthesia of the left half of the larynx, abductor paralysis of the left vocal cord, dysphagia, and paresis over the distribution of the left facial, abducens, and trigeminus nerves.

We have thus discussed the question of paralysis, as involving the muscular structures of the fauces, due to the various forms of bulbar disease, confining our attention largely to the local paralytic manifestations, although it must be borne in mind that in many of the morbid conditions alluded to, and in many of the cases reported, other and prominent symptoms have not been fully discussed, in that our main interest here has to do with those cases which present to the throat specialist. In this connection we should bear in mind that in many instances an ordinary case of facial paralysis, due to pressure on the nerve trunk as it passes through the aquæductus Fallopii, is attended with paralysis of the levator palati and azygos uvulæ muscles of the same side, as observed by Dumesnil and Sanders. This form of palatal paralysis, however, gives rise to no prominent symptoms and is usually overlooked on account of the more evident pathological condition of the facial muscles. The paralysis of the palate, complicating disease of the mastoid, as in the case reported by Gairdner, arose in the same way, in connection with facial paralysis.

Sanders reports a case of palatal paralysis, complicating diabetes, which is of special interest in connection with the supposed location of the diabetic centre in the floor of the fourth ventricle.

Herpes of the Fauces.

This affection consists in the development in the mucous membrane of the faucial region of an eruption presenting all the appearances of true herpes. It is, moreover, attended with certain symptoms, both local and constitutional, which render it analogous with herpetic eruptions on the skin. In an exceptionally large experience in throat diseases I have met with only a dozen cases which I was

disposed to regard as instances of true herpes, although Chapman states that in an experience of six years he has recorded over a hundred cases.

In three of the cases which I have seen the eruption showed itself in the form of herpes iris; that is, there were developed in the mucous membrane small rings of minute papules, partially or completely enclosing a patch of healthy membrane. In another case the small papules seemed to arrange themselves somewhat irregularly in the mucous membrane of one side of the fauces. In another case they formed a line along the junction of the hard and soft palate. These papules manifested no tendency to develop into vesicles, but consisted in minute red points in which the membrane was very slightly raised above the surface.

As to what special condition gives rise to the eruption I am somewhat uncertain, but I am disposed to regard it as a localized inflammation of the papillæ of the subepithelial layer of the mucous membrane originating principally in the terminal filaments of the nerves.

The eruption in all the cases that I have seen has been on the soft palate and uvula, and furthermore it has always been confined to one side. The eruption was not usually a continuous one, but the patches would make their appearance, and after a period of from five to ten days would disappear, and recur again after an interval of perhaps a week, or even longer, sometimes remaining absent for months. The same was true of the individual papules; each showed a tendency to come and go independently of its fellows.

The prominent symptoms to which this eruption gives rise are more or less pain referable to the faucial region, constant and somewhat annoying in character, and increased by deglutition. There is a general sense of discomfort about the throat, attended oftentimes with a most intolerable itching about the parts. The minute spots or papules stand out prominently as to color, showing a deep purplish red, in contrast with the pinkish tinge of the healthy membrane surrounding them. They occur on one side of the throat, and are either scattered irregularly or arrange themselves in the form of rings or circles.

I regard the affection as largely a constitutional one, and hence its successful management depends mainly on the internal administration of remedies.

The treatment from which I have obtained the best results has consisted in the administration of cod-liver oil with barks and iron, in connection with arsenic. These should be given for a considerable length of time until the general health seems fully restored. In

addition to this, certain local remedies may be used, in order to give relief to pain and the intolerable itching to which the affection gives rise. For this purpose I have generally found the best relief from a gargle composed of ten grains of carbolic acid in an ounce of water.

CHAPTER LXX.

BENIGN TUMORS OF THE FAUCES.

The faucial region does not seem to afford a favorable site for the development of benign neoplasms; and since medical literature furnishes but a comparatively few reported cases, I have confined my consideration of this subject mainly to a brief résumé and analysis of the cases which I have consulted.

Tumors of the Soft Palate, Uvula, and Pillars of the Fauces.

Papilloma.—By far the most common form of neoplasm met with in this region is the papilloma which ordinarily attaches itself to the tip of the uvula or to the edges of the soft palate or faucial pillars. These little warty growths may develop without giving rise to any symptoms whatever. In the past few years in my own private practice, I have removed a number. These have been small warty growths, which showed no disposition to extend and presented no indications for operative interference. Occasionally the growths show a tendency to extend somewhat rapidly and to attain considerable size. They seem to arise spontaneously and from no apparent cause. Their favorite site is on the edge of the soft palate and uvula, all of these being parts which are subjected to notable activity of functional movement. Especially is this true of the uvula, in which the largest growths have developed. When small in size, they give rise to no symptoms; as they increase in proportions they seem to cause some little irritation of the parts, with cough and slight expectoration, but mainly a mere sense of uneasiness or irritation; although cough has in some cases been a prominent symptom. The tumor was of such length in one case that it projected into the fauces, exciting nausea and vomiting, especially after eating; while another is reported of a papilloma of the soft palate in a boy aged nineteen, who was the subject of convulsive attacks of a hystero-epileptic character when in a recumbent position. These disappeared completely upon the removal of the growth.

These neoplasms present the ordinary appearances of a papillo-

matous growth met with in other portions of the mucous membrane, viz., a soft, white, mammillated appearance with the outlines which we recognize as characteristic of this form of growth, a sort of cauliflower or proliferating contour. If there is any question of diagnosis, the microscope will reveal the characteristic structure of papilloma.

The treatment consists in the removal of the neoplasm by means of the scissors or snare, cutting not only through its attachment, but somewhat into the mucous membrane in order to obviate any tendency to recurrence, and at the same time to avoid hemorrhage, which is far more troublesome when the warty growth itself is cut through than when the larger vessels at its base are severed. Ordinarily, there is no necessity for cauterizing the base, since if the growth is thoroughly extirpated there is no tendency to recurrence.

Fibroma.—Only seven instances are reported in medical literature of a fibrous tumor developing in this region. As occurring in the soft palate, these tumors present no notable difference from the same variety of growth in other portions of the body. They develop somewhat rapidly, and give rise to no local symptoms other than those which are adventitious and mechanical. Their removal seems to be attended with no especial dangers when the operation is undertaken sufficiently early.

Angioma.—Cases of this form of neoplasm have been reported by several observers.

It is difficult to assign any cause for these growths, although Ellerman suggests that they may have their primary origin in a papilloma which becomes transformed into an angioma as the result of negative pressure in the act of deglutition. They are composed almost entirely of a network of blood-vessels bound together by a delicate connective tissue. The walls of the blood-vessels are exceedingly thin, also the outer investment of the tumor; hence, their surface is very sensitive, and their presence gives rise to more or less pain in deglutition, with faucial irritation.

The diagnosis is easily made on inspection.

The only indications for treatment consist in the radical removal of the growth; and, considering its vascular character and the troublesome hemorrhage which may attend the operation, the galvanocautery loop would seem to afford the safest method of complete extirpation, with the avoidance of troublesome complications in the way of hemorrhage. In Leonard's case the angioma apparently invaded both the hard and soft palate, giving rise to a tumor which nearly completely filled the mouth. In the removal of this the hemorrhage became so excessive as to render it necessary to abandon the primary operation, the wound being plugged for three days before

this was resumed, after which the growth was removed by means of the ligature.

In all the cases recorded, the operation has been successful and no recurrence has been reported.

Adenoma.—This form of neoplasm is of comparatively frequent occurrence in the palate—a fact which may probably be explained by the large number of muciparous glands with which the mucous membrane of this region is endowed.

In the same category we may place fibro-adenoma for the reason that from a clinical standpoint the disease follows the same course essentially as that of adenoma. The same can be said of adeno-enchondroma.

Etiology.—We can assign no cause for the development of these tumors, and can only say that the disease seems to belong essentially to adult life, occurring in most instances between the ages of twenty and fifty. It occurs more frequently among females than males, in the proportion of about two to one.

Symptomatology.—These growths develop somewhat slowly, and cause no notable symptoms until they have attained such size as to interfere with the normal function of the parts. The first symptom to which they give rise is merely that of fulness in the throat, and possibly some interference with the act of deglutition. Pain is occasionally present, due perhaps to pressure on the terminal filaments of the nerve. The voice is affected according to the size of the neoplasm. If the tumor develop upon the posterior surface of the palate, nasal respiration is interfered with. In one case hemorrhage also seemed to be a notable symptom, due probably to an erosion of the turbinated tissues by the pressure of the growth. Respiration may be interfered with if the tumor project backward into the fauces in such manner as to obstruct the entrance of air into the larynx.

These growths are usually sessile in form and contract no adhesion to the mucous membrane, but in one case the growth was somewhat pedunculated. The surface of the tumor ordinarily shows no tendency to morbid changes, and is not usually even eroded by contact with neighboring parts, although in a case reported the surface of the growth was deeply ulcerated.

Pathology.—Adenomata of the mucous membrane usually have their starting-point in certain hypertrophic changes setting in in the normal glandular structures of the part in which they arise. The soft palate being very richly endowed with lymphatics, we naturally find an adenoma of this region containing a considerable amount of this tissue. The framework of the tumor is made up of a delicate stroma of connective tissue supporting a large number of acini. The

spaces between these acini are filled in with lymphatic tissue, the proportion of gland tissue and lymphatic tissue varying in individual cases. According to Deluce the origin of the growth is primarily in an obstruction of the orifice of one of the muciparous glands, resulting in dilatation. This is followed by certain morbid changes, in which hypertrophy of the gland structures becomes a prominent feature.

Diagnosis.—The main difficulty which is met with in the recognition of these tumors is in the differential diagnosis between an adenoma and fibroma. We are aided somewhat here by the clinical history of the case, as a fibroma develops somewhat rapidly, interferes more notably with function, and is usually more painful. As regards the outline of the growth and its density, there is very little difference between the two varieties of neoplasm. They are hard, dense, and resisting to the touch, and irregularly rounded in outline. Moreover, we must remember that, whereas a fibroma is an exceedingly rare disease, an adenoma is one of the most common forms of neoplasm met with in the soft palate; that the adenoma is more frequent among females than males; and that adenoma is usually met with between twenty-five and fifty, whereas the fibroid belongs usually to an earlier decade.

Prognosis.—This form of growth possesses no grave symptoms, and I find no fatal case of this disease recorded.

Treatment.—The only indication for treatment is in the removal of the neoplasm by surgical interference. This consists in cutting down upon the growth and enucleating it. If the growth is large, it is better to make an elliptical incision, in order to provide against any redundancy of the mucous membrane that might be left after the extirpation of the growth. The operation usually is attended with no special dangers, although in one case, in the course of the operation, it became necessary to ligate, first, the common carotid, and subsequently the internal and external carotids, together with the superior thyroid artery. It is interesting to note, in connection with this case, that, although the complications interfered with the successful extirpation of the growth, it subsequently atrophied, probably as the result of the ligation of the arteries. Of course these operations are usually done under the administration of anæsthetics, although Tillaux removed an adenoma from the posterior surface of the palate after applying cocaine. In a case of Dobson's, the tumor projected so far into the cervical region as to necessitate external incision.

Dermoid Tumors.—Tumors of this character are to be regarded merely as developmental abnormalities, and do not belong especially to any particular tissue or region of the body.

A large proportion of these cases have been discovered in post-mortem examinations of abortions or premature births. It would seem that those cases which have been observed in fœtal life were extensive in character and did not belong especially to any region of the fauces, but really involved quite general attachments. This, perhaps, is to be explained by the fact that where the growth is so extensive the result necessarily will be the death of the fœtus *in utero*. In many of these cases the faucial tumor occurred in connection with other deformities, such as cleft palate, club foot, etc.

In a somewhat exhaustive study of this subject by Arnold, a compilation is made of thirty-eight cases of dermoid tumors involving the fauces. Seventeen of these were instances of premature delivery, the child being born dead, while quite a large proportion of the remainder died at birth or a few days later.

The origin of this form of tumor is in all cases to be found in some error of development during fœtal life.

The growth is always pedunculated, its outer investment being formed of ordinary integument, containing hair follicles, sebaceous and sweat glands. Its internal contents are made up mainly of fat, with muscular tissue, cartilaginous plates, and occasionally osseous tissue scattered here and there.

The symptoms to which they give rise are purely mechanical, in that they cause merely a certain amount of interference with the normal functions of the parts in deglutition and respiration. They should be removed with scissors and they show no tendency to recurrence.

Calcareous Degeneration, or Palatoliths.—Anselmier reports two very curious cases of this affection involving the soft palate. In one case a boy aged sixteen presented with a history of difficulty of deglutition and respiration which had lasted a considerable time. He found two masses on the soft palate, one on either side of the uvula, about the size of a hazelnut, which on probing through the dilated mouths of the palatine glands he found to be calcareous. He inserted a tampon saturated with dilute sulphuric acid into these recesses, with the result of the complete dissipation of the calcareous masses. His other case occurred in a man aged twenty-five, in whom he observed three of these masses. The same treatment was successful in this case. Paget, in commenting on these cases, suggests that these formations occurred in the palatine glands and were analogous to salivary calculi.

Tumors of the Tonsil.

As the tonsil is formed in fœtal life by the meeting of the hypoblast, coming up from the intestinal tract, and the epiblast, pouching in through the oral cavity, it is the meeting-point of two forms of embryonic tissue, and theoretically should afford an exceedingly favorable site for the development of neoplastic growths. Clinical experience, however, teaches us that benign neoplasms are comparatively rare in the tonsils. The explanation of this undoubtedly lies in the fact that the activity of morbid processes in the tonsil belongs to the earlier period of life, and, furthermore, that in adult life the lymphatic tissue which composes these organs undergoes certain retrograde changes in the nature of an atrophy, as the result of which they either completely disappear or become masses of inert tissue.

Fibroma.—Considering the character of the tissue and its activity in early life, we might perhaps conclude that it would naturally afford a favorable locality for the development of connective-tissue growths; and as a matter of clinical observation we find that many of the tumors which occur in this locality are fibro-plastic in character.

Their principal interest lies in the recognition of their clinical significance, for they very rarely give rise to any dangerous symptoms, and in no instance has a fatal issue even threatened; unless perhaps we except a case of Leffert's, in which the tumor attained to such a size as to render the patient's condition somewhat critical on account of the danger of suffocation.

They develop quite insidiously and, as a rule, grow very slowly. The presence of the growth in the tonsil seems to give rise to no symptoms whatever, and it is only when it has attained such proportions as to interfere with the functions of the fauces that the patient usually becomes conscious of its existence. The first effect of its presence seems to be in its interference with the free movements of the muscles of the fauces in deglutition, and latterly it opposes itself as a mechanical obstacle to the passage of the food. When it is pedunculated and freely movable, the growth may fall down over the entrance to the larynx and interfere with the respiratory movements, although no instance is reported in which the dyspnœa has been of a serious nature.

The recognition of the growth should be comparatively easy, as there are few tumors that present so characteristic an appearance, in their pinkish-white tinge, somewhat nodulated or rounded outline, and their dense resisting feeling to the touch.

The only question of diagnosis that occurs, then, is as between the

benign and malignant growths—a problem which should rarely present any difficulties.

These growths should be removed by the scissors or the écraseur, as they are pedunculated or sessile. I think, however, that cases which are not better treated with the cold-wire écraseur are very rare.

In Curling's case wider access to the tumor was obtained by enlarging the oral orifice by an incision through the cheek; while Bottini made an incision through the soft palate, in order to more easily reach the tumor. The necessity for any such measures as these, I take it, will very rarely present, especially if we resort to the use of the snare; the stiff wire loop of this instrument is easily manipulated, and can be carried with great facility over a tumor and adjusted about its attachments with sufficient accuracy to render the operation comparatively simple, even in cases in which the tumor has attained a large size. In Curling's case the tumor had formed adhesions to the palate. Of course in an event of this sort such attachments can easily be broken up by the finger or by any convenient blunt instrument.

Tumors of the Oro-Pharynx.

The oro-pharynx seems to afford an unfavorable site for the development of benign neoplasms; medical literature furnishes us with but few examples of growths in this locality. Some cases have been reported of dermoid tumors.

CHAPTER LXXI.

SARCOMA OF THE FAUCES.

Our consideration of this affection will be based on an analysis of such cases as have been reported in medical literature, dividing the subject as before into: First, sarcoma of the soft palate and pillars of the fauces; second, sarcoma of the tonsils; and third, sarcoma of the pharynx.

Sarcoma of the Soft Palate and Pillars of the Fauces.

Etiology.—We find recorded in literature twenty cases of sarcoma originating in the structures of the soft palate.

We should naturally suppose that sarcoma of the palate would be somewhat closely allied to that of the pharynx in its clinical history, and yet, curiously enough, we find that whereas in the latter the disease belongs more particularly to the middle period of life, in the one under consideration it seems to skip this period and to occur either early or late in life. Thus, of the cases recorded, seven occurred beyond fifty, while nine were met with earlier than the forties. When compared, however, with the tonsil we find that sarcoma in this region seems to be common to every period of life, though with something of preponderance in the later years.

Pathology.—Of the cases reported, four were round-celled, two spindle-celled, two myxo-sarcomas, one each of cylindroma, alveolar, and adeno-sarcoma, one case was mixed-cell, one was melanotic, and one was fibro-plastic in character. In six cases the character of the growth is not given.

Sarcoma of this region seems to carry out, in a notable degree, the idea that this disease tends to localize itself, for we find that the lymphatics were involved in but six of the cases. That this was a serious complication is shown by the fact that there was recurrence in four cases, although one is reported as having been cured.

The development of a sarcoma in the palate seems to be somewhat insidious, and its extension slow. In a majority of instances the neighboring tissues are not invaded.

When we consider the soft, fleshy character of the tumor and its location in a region so notably subjected to functional movements, we should naturally suppose that ulceration of the surface would be a frequent symptom. This has been observed in a number of the reported cases, although it is by no means a constant feature.

Symptomatology.—The development of these tumors is somewhat insidious, and they give rise to notable symptoms only after they have attained such proportions as to interfere with the functions of the part. Where the growth is of such a character as to overhang the larynx, dyspnœa may be produced; or if the tumor is movable it may lead to attacks of suffocation, especially when the patient is in a recumbent position. The secretion from the parts is naturally increased. In no case, so far as I know, has hemorrhage been a serious complication during the course of the disease, although slight hemorrhage is reported in several cases. Ordinarily pain is not present, although in one case it seems to have been notably distressing. In no instance was the general health impaired; in other words, sarcoma of the palate gives rise to no special cachexia.

Diagnosis.—The characteristic reddish pink color and fleshy appearance of the tumor in this region, together with its round contour, would naturally suggest either an adenoma, sarcoma, or fibroma. The microscope, however, should settle the diagnosis.

Prognosis.—All the cases reported were operated upon, with the exception of two. In neither of these cases, however, does the report show the total duration of the disease; hence it is difficult to form any estimate as to how long a patient with sarcoma of the palate will live without operative interference. In general, however, it is quite clear that sarcoma in this region is not an especially malignant disease, as is shown by the fact of successful operations, even after the disease has existed for a long time.

We find that of the twenty cases there was death without operation in three, death following operation in seven; in eight cases the operation seems to have been successful, while in two the ultimate history is not given, although it is probable that both these cases succumbed later to the disease. This is a percentage which, considering the ordinary malignancy of sarcoma, is to be considered as strikingly favorable, nearly one-half the cases being cured. It is interesting to note that of the four round-celled sarcomas, two were cured, while the other cases which were cured were respectively alveolar, spindle-celled, myxo-, and mixed-celled sarcomas.

Treatment.—Foulis performed a lateral pharyngotomy, the object apparently being to overcome the serious complication of hemorrhage in the fauces, inasmuch as the growth is reported to have been

the size of an egg and probably could have been reached through the mouth. This danger of hemorrhage seems also to have been feared by Albert and Treves, the latter of whom ligated the carotid artery before operating, while the former placed a ligature in position for use in case of necessity. That this is a danger to be considered, however, is hardly made evident by the report of cases. In all the other cases the operations were done through the mouth, the tumor either being enucleated, excised, or snared. No suggestion can be made as regards the special instrument to be used or special method to be pursued in these cases. The indications are to remove not only the whole of the neoplasm in the fauces, but any of the cervical glands which may have become invaded by the morbid process.

Sarcoma of the Tonsil.

If the number of cases reported in current literature is any indication of the frequency of the disease, we find that carcinoma is by far the more common form, outnumbering the cases of sarcoma more than twofold.

In most of the reported cases, the data are sufficiently full to warrant fairly definite conclusions being drawn.

Etiology.—Sarcoma is usually regarded as a disease belonging to the earlier periods of life; and yet, curiously enough, when invading the tonsil it seems to belong more particularly to adult life.

We find but fourteen cases occurring before the age of forty, and twenty cases occurring later. Why this should be, it is at first sight not easy to explain. It certainly is a very striking fact, to one seeing a large number of cases of disease of the upper air passages, that those lymphatics which go to make up the faucial and pharyngeal tonsils, especially the latter, play an exceedingly important part in morbid processes in the throat. It would seem that the lymphatic structures in this region in persons from five to fifteen years of age are exceedingly active, from fifteen to forty-five they are quiescent, and after forty-five they take on a renewed activity, of the nature of which we seem to be in entire ignorance except so far as we observe the outward manifestation in the symptoms referable to the air tract. This may suggest the cause of the development of a sarcoma in the tonsil in so large a proportion of cases during the earlier and later decades of life.

As regards sex, twenty-eight cases occurred in males, nine in females, and in eight the sex is not reported.

We usually expect to find a larger number of cases of malignant disease among males than among females, but the preponderance here

is perhaps unusual, and is only to be still further accounted for by the fact that the habits of life and the exposures to which men are subjected lead to the development of a diseased condition of the upper air passages, which may possibly exercise a certain predisposing influence in the development of malignant disease.

Pathology.—A sarcomatous tumor when occurring in the tonsil presents the ordinary characteristics of this variety of neoplasm when met with in any other portion of the body. It belongs essentially to the connective-tissue series of neoplasms; hence, having its origin in this elemental tissue in some portion of the tonsil it develops ordinarily somewhat rapidly, infiltrating and displacing the normal tissues and extending to the parts beyond. Its progress usually differs from that of carcinoma in that this form of malignant disease extends forward to the base of the tongue and palatine arches, whereas sarcoma shows a tendency either to remain stationary or to extend backward into the oro-pharynx. The only instance, so far as I know, in which it has been known to extend forward into the mouth was one in which the gums and palate were involved. In the majority of instances the disease diffuses itself into the surrounding parts, although occasionally we find it encapsulated. When the neoplasm is invested with a capsule, this does not necessarily define the limits of the tumor, for the reason that the sarcomatous tissue may in any given case be found beyond the capsular limit.

The extension of the neoplasm is not only, as before stated, inward, encroaching upon the pharyngeal cavity, but it also penetrates the tissues of the neck, making its appearance externally, where it may assume considerable proportions and should not be confounded with the secondary enlargement of the lymphatic glands of the neck. When we consider the malignancy which the clinical history of these cases indicates, and which is manifested by the extension and dissemination of the neoplasm, we should naturally expect this to be evidenced, in the very large proportion of cases, somewhat early in the history of the disease, by the involvement of the cervical glands. When there is dissemination of the sarcoma, there seems to be a greater probability of recurrence.

Symptomatology.—The development of a sarcoma in the fauces is usually somewhat insidious, and it makes its presence known mainly by its mere mechanical interference with the function of the parts, rather than by any subjective symptoms.

Hemorrhage was noted in seven cases, causing death in two instances, and was of such a serious nature in a third as to demand ligation of the common carotid artery.

The further symptoms which develop as the growth increases in

size are largely mechanical. Deglutition becomes interfered with, and dyspnœa is occasioned which may become distressing. The presence of the growth naturally excites an increased secretion, which adds much to the discomfort of the patient. In addition to this, the erosions or ulcers on the surface of the tumor naturally give rise to a discharge of somewhat ichorous and oftentimes ill-smelling pus.

It would seem in some cases that a cancerous cachexia is almost as characteristic of sarcoma as of carcinoma, and yet this is not to be accepted implicitly, for it must be remembered that a sarcoma in the fauces assumes an exceedingly malignant form, more so perhaps than sarcoma of any other region. Moreover, it gives rise to symptoms which react in a very marked way on the general system. Add to this, the fetid discharges, repeated attacks of hemorrhage, and perhaps dyspnœa, and we have, I think, quite sufficient to account for the very marked cachexia which shows itself in these cases, without considering it as due to a specific sarcomatous or carcinomatous dyscrasia. Fixation of the jaw is a notable characteristic of carcinoma rather than of sarcoma. This symptom, however, was present in one case, and is probably to be accounted for by the fact that the neoplasm encroached upon the temporo-maxillary articulation in such a way as to give rise to a morbid deposit or an inflammatory process. In this same case suppuration occurred in the external tumor, in connection with a still further and rather curious complication, viz., a glossitis, affecting first one side of the tongue and then the other, which disappeared spontaneously, however, in a comparatively short time.

Diagnosis.—While the commencement of the tumor is somewhat insidious, it is usually accompanied with a certain amount of injection of the mucous membrane surrounding it, which, as before stated, may lead to the mistaken diagnosis of a quinsy. The absence of fever and of notable pain in deglutition, and other symptoms which accompany quinsy, ought soon to eliminate the question of a suppurative inflammatory process. The main interest in diagnosis is between carcinoma and sarcoma, and this can be positively settled by the microscope only.

Prognosis.—As the result of its location, sarcoma in the tonsil is to be regarded as of nearly as great malignancy as carcinoma in this region. This view is not entirely sustained by an analysis of the cases reported, and yet such analysis goes very far toward establishing the truth of this assertion. In eleven of these cases no operation was done, and the patients succumbed at the end of periods varying from two and a half to fifteen months. Nine cases are reported as having been operated upon by lateral pharyngotomy, galvano-cautery,

écraseur, and other methods, all of which resulted in death in periods varying from two to twelve months from the commencement of the disease. In six cases operations were done by which the disease is reported as having been successfully extirpated. In Hueter's case the operation seems to have been successful, but the patient died soon after of pneumonia. In Cozzolino's case death occurred seven months later from apoplexy, while Mickulicz's patient died three months after the operation, up to which time there apparently had been no recurrence. Zsigmondy's case was operated upon, and no recurrence is reported at the end of one month, while in White's, Pollard's, Jardon's, and Langenbeck's cases we have no record of the ultimate results of the operation. Of the remaining cases the reports are imperfect.

The very great fatality of sarcoma in this region is undoubtedly largely dependent upon the fact that the lymphatic tissue of the tonsil is very intimately and closely connected with the lymphatics of the neck, as the result of which the cervical region becomes involved very early in the history of the disease, and in many cases, as we have seen, the tumor in this region assumes larger proportions than in the fauces. This not only complicates the operative procedure which is resorted to for the extirpation of the growth, but, furthermore, adds greatly to the difficulties of completely removing every centre of sarcomatous development. In consequence of this latter, of course, recurrence takes place in quite a large number of cases.

Yet, while sarcoma of the tonsil must be regarded as an exceedingly fatal disease, we are certainly warranted in the assertion that in a small proportion of the cases the eradication of the neoplasm may be hoped for.

Treatment.—The first and prominent indication seems to be the thorough extirpation of the growth by such means as will accomplish the end with the least degree of injury to surrounding parts; while at the same time any danger of stimulating renewed activity of development in the sarcomatous process should be avoided.

I have no personal experience with this form of neoplasm as affecting the tonsil, but I am disposed to be somewhat decided in my opinion that when available the cold-wire snare écraseur should be resorted to. My preference for this is perhaps largely based on the successful issue in the case of sarcoma of the naso-pharynx, and the two cases of sarcoma of the nasal passages, referred to in other chapters, notably of the former, wherein the ill effect of the galvano-cautery seemed to be very strikingly illustrated, especially when it was used in the lower pharynx and in the region of the tonsil. It

might be not improper to recall in this connection that in the case of sarcoma of the naso-pharynx referred to, the tonsil and lower pharynx were subsequently involved.

In one case, success with ligation of the carotid and iodoform injections has been reported. I am disposed to think, however, in this case that the shutting off the blood supply had far more to do with the dissipation of the tumor than the injections.

As regards those cases which involve the cervical tissues, of course the successful extirpation of the neoplasm can be accomplished only by lateral pharyngotomy.

Sarcoma of the Pharynx.

The tonsil, being the meeting-point of the hypoblast and the epiblast in the development of fœtal life, is a favorable site for the occurrence of neoplasms; and furthermore malignant disease in the tonsil takes the form of carcinoma rather than of sarcoma. Coming now to the pharynx, a region which belongs rather to the hypoblast alone, this tendency to neoplastic growth apparently disappears to a certain extent; and, furthermore, as regards malignant disease, there seems to be no very special preference as to the form which this takes; for whereas, the pharynx being composed largely of connective tissue, we should naturally expect to find a notable preponderance of sarcomatous growths, as a matter of clinical observation carcinoma seems to be nearly as frequent and both forms much less frequent than in the lymphatic tissue of the tonsil.

A striking difference is noted between sarcoma of the pharynx and sarcoma of the tonsil; while the latter is an exceedingly grave disease, with a fatal termination in the very large proportion of cases, the former is, as a rule, quite amenable to treatment. This can be explained only by the fact of the rich lymphatic distribution in the tonsil, and its close and intimate relation with the lymphatics of the neck. This results in a very early involvement of this latter region in the extension of the tumor. In the pharynx, on the other hand, the disease seems to be localized from the onset, owing to the lymphatic glands not becoming involved.

Etiology.—We find that sarcoma in this region seems to be a disease of middle age, in that most of the cases occur between thirty-five and fifty. As regards sex, the general rule of malignant disease obtains, that about two-thirds of these growths are met with in males, the proportion of males being not so great as we found to be the case in sarcoma of the tonsil.

Pathology.—A sarcomatous neoplasm in this region presents no

features which differ in any essential degree from the same tumor as found in other portions of the air tract. As regards the variety of sarcoma, in many of the reported cases this is not specified, while in two it is reported as fibro-sarcoma, in two round-celled, in two spindle-celled, while there were one each of plexiform, giant-celled, albuminoid, fibro-myxo-sarcoma, and adeno-myxo-sarcoma.

Clinical histories show that, while in a few of the cases reported the cervical glands were involved, in the majority of them this complication seems not to have been present. Of course, when this existed it must be accepted as a tendency to generalization. As regards any further tendency toward involvement of other organs of the body, I find no record of such, although, with reference to sarcoma of the tonsil, several instances are given in which some of the viscera were invaded.

Symptomatology.—A sarcoma in the pharynx makes its presence felt, in the early history of the case, merely as a mechanical obstruction to the ordinary functions of the parts, especially with reference to deglutition. In many cases this is the only symptom which presents until the tumor has attained such size as to overhang the larynx and to interfere with the entrance of air. When this latter condition obtains, the dyspnœa is usually comparatively slight during waking hours, but is notably aggravated by the recumbent position. Secretion from the surface of the tumor itself is usually limited, although the accumulation of an excess of mucus, owing to the immobility of the parts, may become a notable symptom. The secretion is also liable to be stimulated to an extent by the presence of the growth.

Pain is never in any way a prominent symptom; in fact, these growths develop in an insidious and painless manner, and their whole clinical history is marked merely by mechanical interference with the function of the fauces. Hemorrhage, so frequently met with in sarcoma of the tonsil, is not usually present. If the growth extends upward into the upper pharynx, or presses upon the soft palate, nasal respiration is interfered with and phonation is notably impaired.

In no instance, so far as I know, was cachexia present. The general health usually becomes impaired, however, when the tumor has attained such size as almost to completely fill the pharyngeal cavity, rendering the swallowing of solids impossible.

Diagnosis.—A definite diagnosis can usually be made only by microscopic examination of a portion of the growth.

Prognosis.—As before intimated, sarcoma of the pharynx is by no means the very grave disease which it is in the tonsil. If we examine the cases reported, we find that, in quite a large proportion of them,

the disease seems to have been entirely eradicated. The course of the disease was unfavorable when the cervical glands were enlarged.

When the sarcomas contained a large amount of fibrous tissue they got well, whereas among the fatal cases were round-celled and giant-celled sarcomas.

TREATMENT.—These growths are easily accessible through the natural passages, and ordinarily require no incisions through healthy parts, although it may become necessary to make an incision through the soft palate. At the present day, with our improved methods of manipulation, it is doubtful if such a procedure would become necessary. In a number of instances in which the growth was encapsulated, and it seems to have been encapsulated in a large proportion of the cases reported, a linear or crossed incision was made through the investment, and the growth simply enucleated by the index finger.

When these tumors assume the pedunculated form, the most available method of operating would consist in placing the loop of the écraseur around the pedicle and severing its connections. The question arises here, of course, as to the comparative advantages of the cold-wire loop or the galvano-cautery. The prominent justification for the use of the galvano-cautery écraseur is in the avoidance of hemorrhage, though dangerous hemorrhage is not an accident to be anticipated. I am disposed to doubt whether this instrument should be given preference, especially when we consider the ease and simplicity of manipulation of the cold-wire snare. Moreover, by the slow manipulation of the steel wire, expending an hour or longer, if necessary, in slowly contracting the loop, the loss of blood can be very materially avoided. Moreover, we should always bear in mind the fact that the use of the galvano-cautery is capable not only of exciting inflammatory reaction but possibly of stimulating a recurrence of the growth.

In many instances a preliminary tracheotomy was done before the removal of the neoplasm. The advisability of this course will be decided in each individual case by the symptoms present, and the character and the size of the tumor. In one case, before the operation, the carotid artery was ligated, because the surgeon detected evidences of dilatation in this artery, and for this reason feared troublesome hemorrhage.

If a case should present which from its special features should seem to demand the gaining access to the pharynx by external incision, the choice would lie between a lateral pharyngotomy and a subhyoidean pharyngotomy.

If, after the primary operation for the removal of a tumor, fragments of sarcomatous tissue should be observed at the seat of the

wound, the question arises as to the destruction of this by the galvano-cautery or other measures, or its removal. I think there can be no question as to the advisability of removing it by means of the snare, or such other means as may be attended with the least danger of inflammatory reaction. Certainly the use of caustics should be resorted to with hesitation.

It is scarcely necessary to add in conclusion that if any of the cervical glands are involved, it is the duty of the surgeon to remove them at the same time that the faucial tumor is extirpated.

CHAPTER LXXII.

CARCINOMA OF THE FAUCES.

This subject is subdivided, as in the previous chapter, into: First, carcinoma of the soft palate and faucial pillars; second, carcinoma of the tonsil; and third, carcinoma of the oro-pharynx.

Carcinoma of the Soft Palate.

Etiology.—Perhaps the most striking fact elicited by a review of the literature of this subject is the remarkable predominance of male victims in carcinoma of the velum and pillars. Of course this can only be regarded as a coincidence, and, while somewhat remarkable, one possessing no clinical importance.

As regards age, the majority of cases occur beyond middle life, thus obeying the ordinary rule in regard to malignant disease.

The only other fact which is of interest in regard to etiology is the apparent development of malignant disease from non-malignant in some of the reported cases.

Pathology.—It is a somewhat noticeable fact, in carcinoma of the soft palate, that it shows a tendency, at least, to confine itself to the tissues of the velum. Certainly a review of the cases would seem to establish this fact, or else they show that a cancer in this region runs such a rapid course that it produces death before neighboring regions have been invaded. Of course this is rather a tendency than an observable fact, since evidence of extension has been observed in all cases.

An investigation of the primary origin of cancer in the soft palate would necessarily be somewhat speculative. Its probable source, however, is to be sought either in the muscular tissue or the mucipara-rous glands, presumably the latter, since cancer of muscular tissue is exceedingly rare. The glands penetrate the muscular tissues; hence these structures are involved secondarily. Its further extension would seem to have some respect to the anatomical character of the surrounding structures. Thus, while in most cases the disease confines itself to the soft palate, its most frequent extension is through the pillars.

There seems to be a very notable disposition of carcinoma of the fauces, when it commences in the glandular structures, to avoid the lymphatic tissues in its extension. In those cases, however, in which it commences in the lymphatic structure, as in the tonsil, it shows no hesitancy whatever in invading the other tissues, such as the glandular or muscular structure of the soft palate and other surrounding parts.

Most of the cases have been reported as simply carcinoma or cancer, although the clinical histories would seem to indicate that the majority of instances were epithelial in character. In a case reported by Gross, an apparently benign warty growth of six months' standing took on malignant action. This we regard usually as an exceedingly rare event, but, considering that it was reported by so careful an observer, must be accepted as an undoubted instance of this transformation. Similar cases have been reported by others. It is believed by a number of observers that a malignant transformation is by no means an uncommon result in leucoplakia.

Symptomatology.—The early stages of the development of a cancer in the palate give rise ordinarily to no symptoms other than a certain amount of mechanical interference with deglutition, while at the same time the voice assumes a muffled tone, its nasal resonance being absent according as the tumor obstructs the palato-pharyngeal opening.

The mucous membrane covering the tumor is not usually inflamed, and there is no hypersecretion.

As the tumor increases in size these symptoms become more marked, and in certain cases there is the additional symptom of dyspnœa when the growth projects over the orifice of the larynx.

Pain, which is usually so characteristic of cancerous growth, does not seem to have been present in many of the cases reported. The absence of pain is probably to be explained by the fact that the growth develops in a soft and yielding tissue, and that the disease runs a somewhat rapid course.

In a certain proportion of cases ulceration occurred comparatively early, and was attended of course with the ordinary discharge so characteristic of cancerous degeneration.

I find no note made in any case either of mild or excessive hemorrhage from the ulcerated surface during the progress of the disease, although it followed a recurrence of the disease after operation in one case.

The dyspnœa may become so urgent in some cases as to demand tracheotomy. This symptom seems sometimes to be due to the interference with the passage of air into the larynx, and not to any

secondary affection of the air passages below; although excessive enlargement of the cervical glands may cause stenosis of the larynx by external pressure.

The early development of the cancerous cachexia seems to have been a notable characteristic of the disease, in that in all cases in which this is specially noted it occurred within a few months after the commencement of the affection.

Diagnosis.—The tumors which are found in this region are papilloma, adenoma, fibroma, sarcoma, and carcinoma; the points in the differential diagnosis need not be referred to, for the microscopic examination will at once settle the real character of the growth.

Prognosis.—It is scarcely necessary to state that the prognosis in these cases is exceedingly unfavorable. I find in the reported cases that in five instances death occurred without operative interference. The longest time which the patient survived the disease was nine months, while the shortest was seven. Five cases were subjected to operative interference, followed by death in from one to ten months. There was recurrence in each instance in from one to five and a half months, with the exception of Chassaignac's, whose patient died three weeks after the operation. In other cases reported the details are so imperfect as to render them of no prognostic value.

Treatment.—In view of the excessive fatality which has attended the disease in the cases reported, and the almost entire failure of such operative measures as have been resorted to in arresting the progress of the disease, any suggestions as regards treatment would seem almost unnecessary; and yet we are scarcely warranted in concluding that operative measures have not been of service; for, whereas we fail to determine that life has been notably prolonged, we certainly must recognize the fact that the comfort of the patient has been ministered to in no small measure, when we consider that after the removal of the tumor a recurrence may possibly be postponed as long as five and a half months.

Carcinoma of the Tonsil.

When we consider that carcinoma belongs essentially to the later years of life, and to a period when the peculiar structure of which the tonsil is composed is inert and practically in a state of atrophy, we should naturally suppose that this region would be comparatively free from the primary invasion of malignant disease. This is true when we compare the frequency of cancer in the tonsil with its frequency in other regions of the body; but when we note the frequency with which the tonsil is invaded as compared with other regions of the

fauces, we find that in the very large majority of instances the disease apparently has its primary origin in this gland, although subsequently it may invade the soft palate, pillars of the fauces, base of the tongue, and other regions.

Etiology.—That the tonsil should present a more favorable site for the development of cancer than the fauces, is, perhaps, not difficult to understand when we remember the character of the tissue found there, composed as it is almost entirely of epithelial structure.

As regards the age at which it occurs, we find the same rule as governs the development of carcinoma generally. Malignant disease, as a rule, is met with among females more frequently than among males; yet, curiously enough, when it involves the tonsil the males outnumber the females more than two to one.

The use of tobacco is said to have some influence on the development of buccal and faucial carcinoma. Statistics, however, do not seem to support this suggestion, certainly in reference to the development of the disease in the tonsil. The same probably can be said in regard to the use of alcohol.

Pathology.—The assertion has been made that sarcoma is the most common form of malignant disease found in the tonsil, the statement being based on the fact that this organ is composed very largely of round-cell tissue, referring undoubtedly to the lymphatic structure of the tonsil. In the cases reported it is difficult to determine, with any degree of accuracy, how many had their primary origin in the tonsil; but we are bound to conclude, from the character of the reports, that a very large number of these instances were really cases of primary malignant disease of this structure.

Statistics, I think, will show that carcinoma is much more frequent than sarcoma. But, in the large majority of instances, cancer of the tonsil manifests itself in the form of epithelioma. Why this should be true, we can easily understand from the minute anatomy and the development of the organ.

As the result of the close and intimate connection between the lymphatics of the tonsil and the cervical region, secondary engorgement occurs very early in the history of the disease and becomes a prominent feature in its course.

On account of the rich distribution of lymphatics in the neighborhood of the tonsil and its close connection with the cervical glands, we might infer that generalization of the disease might not be uncommon; yet the clinical history of the cases observed would seem to indicate that this is not a result to be anticipated.

Symptomatology.—The earliest symptom to which the disease usually gives rise is pain of a somewhat sharp and lancinating char-

acter on deglutition, which increases rapidly with the development of the tumor, until it finally becomes constant. This pain is usually referred to the faucial region, but extends in the direction of the ear. In some cases the pain seems to locate itself in the ear entirely, giving rise to no symptoms which direct attention to the throat.

The increased flow of saliva is a somewhat prominent symptom, commencing quite early.

The voice is affected according to the size of the growth.

The secondary enlargement of the cervical lymphatics occurs very early in the history of the disease, and has been present in nearly every instance reported. This glandular enlargement may make its appearance and be very extensive even before the attention of the patient has been called to the existence of any faucial disorder. The cervical invasion comes on suddenly, and assumes large proportions from the outset, after which, as the disease in the fauces progresses, the cervical glands enlarge somewhat slowly. When the disease has once fixed itself in the tonsil, it runs a rapid course, causing this infiltration of the cervical lymphatics very early in its history, after which this secondary enlargement remains practically quiescent. A suppuration of these tissues may occur, although this is comparatively rare.

Ulceration usually occurs during the second or third month of the disease, very rarely being delayed beyond the fourth month. When this symptom sets in, there is a noticeable increase of the secretions, which are of a whitish-gray color and of a somewhat tenacious consistency. The discharge from the ulcerated surface is not infrequently tinged with blood from the rupture of minute blood-vessels invaded by the disease. Of course no blood-vessel is safe from erosion which lies in the track of the ulcerative process; hence an excessive hemorrhage may occur if the tonsillar or ascending pharyngeal arteries are involved, and this, though fortunately rare, is a complication that is liable to occur.

Cough is not infrequently present, as the result either of the secretions in the fauces or of some slight secondary laryngitis or bronchitis.

Coincident with the development of the ulcerative process the breath becomes fetid. The further development of local symptoms is dependent mainly on the proportions which the growth attains and the direction in which it extends. As a rule, this latter is into the soft palate and base of the tongue and forward into the cheeks, thus giving rise to more marked difficulty in deglutition. If it extends backward toward the larynx and encroaches upon its lumen, dyspnœa may occur merely as the result of mechanical interference

with the entrance of air to the lungs, or œdema of the larynx may set in. If the tumor presses upon or in any way includes the Eustachian tube, the hearing may become notably impaired. We should naturally suppose that this would be a very frequent complication, yet it is somewhat rare, owing to the fact that the disease does not readily pass over the posterior pillar of the fauces into the tissues beyond.

Comparatively early in the history of the disease the patient commences to feel somewhat the effect of impaired nutrition, as shown by the loss of weight and slow emaciation. This is early followed by that peculiar condition which we recognize as constituting the cancerous cachexia, which is probably to be considered as a form of blood poisoning.

Diagnosis.—The mere fact of a tonsil becoming enlarged in size, or the seat of any neoplasm in adult life, carries with it the suspicion that this augmentation is due to malignant disease, especially if the enlargement is unilateral. Of course mere hypertrophy of a single tonsil in adult life is not an unusual thing to meet with; but if we meet with a case in which the clinical history shows clearly that a unilateral increase of size in the tonsil has been the result of recent development, in a patient between the ages of forty-five and sixty, the probabilities very largely point toward its being a malignant process.

Any tumor which, developing near the tonsil, presses it out of its bed and causes it to protrude into the fauces, might possibly lead to an error in diagnosis, and yet it must be remembered that, when this occurs, the tonsil preserves its characteristic appearance of a soft whitish-gray mammillated surface, marked by the numerous orifices of the normal crypts; while malignant disease, fixing itself on this organ, changes the whole gross aspect of the tissue, and shows itself by notable appearances to be a true neoplasm.

There is something in the appearance of cancerous disease which is characteristic and almost unmistakable when it presents itself in superficial structures. The onset of the disease is marked by a cellular infiltration of the tissues immediately beneath the mucous membrane covering the surface of the tonsil. As the result of this, the blood-vessels are displaced, the surface of the tonsil becomes bleached as it were, and presents a peculiar white aspect covered by shining mucous membrane, which, still maintaining its normal state, is stretched to an unusual degree. It presents, therefore, a dry, glazed aspect with a suggestion of thinness and transparency, through which we see a mass of what appears to be morbid tissue beneath. The normal mammillated surface of the tonsil is thus converted into a number of somewhat large rounded lobules. Here and there are seen

minute blood-vessels traversing the tissues immediately beneath the mucous membrane, and standing out prominent and well defined over the white background. This definition, as we may call it, of these minute blood-vessels is especially marked round the edges of the tonsil, and constitutes a feature of the early development of malignant disease which possesses a certain amount of diagnostic value. The further changes consist in a more or less rapid increase in size of the organ, until, as the result of crowding of the tissues by the new deposit, the superficial layer breaks down and an ulcerated process is the result. The ulcerated process presents appearances which also are quite characteristic. The surface presents a fine, almost granular appearance, is of a whitish color, with a slightly bluish or pinkish tinge, is usually traversed by minute fissures, and is coated with a scanty whitish-gray secretion. As the ulceration extends and its surface increases, these fissures also increase in extent and depth. The edges of the ulceration are usually raised somewhat above the ordinary surface, to meet a raising up, as it were, of the mucous membrane which overlaps it, the two surfaces meeting apparently at the apex of a circumvallate ridge, while the whole is surrounded by a well-marked areola of redness. This areola, moreover, is notably of a bright red, somewhat scarlet color, in contradistinction to the redness of the venous plethora. As the disease progresses and extends beyond the tonsil into the tissues of the surrounding parts, we have developed a new condition, which we may describe as a cauliflower-like appearance of the growth. In this we find the edges of the ulcer completely everted and lying over upon the mucous membrane beyond, in such a way that somewhat extensive flaps here and there can be raised up by means of a probe and turned back again upon the ulcerated part. On palpation with the finger, both before ulceration and later, the diseased surface gives the sensation of density and resistance which is almost unmistakable. This is particularly noticeable after the ulceration has occurred, when, on passing the finger over it, the different lobules which make up the growth easily differentiate themselves under the touch, and give forth a sensation of hardness which is simulated by no other diseased condition.

The diagnosis, then, should not present many points of great difficulty; nevertheless, the tumor should at once be submitted to microscopical examination.

Prognosis.—As has been already suggested, malignant disease in this region runs a somewhat rapid course, owing to the constant motion and attrition to which the parts are subjected, and is an exceedingly grave affection.

In a number of the reported cases, no operation was attempted,

and the disease was allowed to run its course, except so far as local and palliative measures may have influenced its progress.

In seven of these cases, six males and one female, with ages varying from thirty-two to eighty-two, the disease ran its course in from two to sixteen months.

It would seem, then, that we should regard carcinoma of the tonsil as a disease which, if allowed to run its course without interference, will certainly result in a fatal termination in from twelve to eighteen months.

When, however, we come to investigate those cases which were operated upon, we find that there is little question that such measures as snaring, curetting, and cauterization serve to postpone the fatal termination, and also add somewhat to the comfort of the patient.

We find in glancing over the histories of these patients, that some of them died as the result of the operation, while the remainder succumbed to recurrence of the disease. If we compare the average duration of life of those in the group of cases operated upon, with that in the group of cases in which no operation was done, the percentage in favor of the operation does not seem to be very great; and yet it must be borne in mind that in many cases the patients survived the operation and were free from the disease for periods varying from three to five months before recurrence set in. Furthermore, a number of instances have been reported in which the operation was successful and the disease apparently completely eradicated.

Treatment.—The indications for treatment are thoroughly covered in the brief allusions to the histories of the cases above given. They consist, of course, simply in the complete extirpation of the tumor at the earliest possible period. The important question to be decided upon in this connection is not so much what operation shall be resorted to as whether any operation is justifiable. This will depend entirely on the general condition of the patient, the extent of the tumor, and the probability of its successful removal. Of course if the cancerous cachexia has already manifested itself in a notable manner, and the tumor has already so extended itself to neighboring parts as to render its complete extirpation impossible, no operation will be attempted. When, however, the general condition of the patient warrants it and the tumor is accessible, there can be no question as to the advisability of removing it.

The choice of the operation, whether by means of the wire-snare écraseur, the galvano-cautery, the ligature, or lateral pharyngotomy, must be decided by the rules of general surgical procedure and the special indications in each individual case. There can be no question as to the preference which should be given to the use of the wire-

snare écraseur, provided the character and contour of the faucial tumor will admit of its use. By this instrument either the whole mass can be extirpated, or it can be removed piecemeal, much assistance being obtained by the local anæsthetic properties of cocaine. The objections to the galvano-cautery mentioned in the preceding chapter obtain equally in the discussion of the surgical treatment of carcinomas.

Various operations have been resorted to for gaining access to the tumor by means of external incisions, most of which constitute really capital operations.

They will be more fully described in the chapter devoted to the external surgery of the pharynx. The question of preliminary tracheotomy, which in many of the procedures was considered necessary, is one to be determined by the symptoms and conditions which present in each individual case.

Carcinoma of the Pharynx.

It would seem that few regions of the body are more exempt from the invasion of carcinoma than the lower pharynx.

An investigation of the current literature of later years, however, would seem to suggest that perhaps this form of malignant disease is more frequent than was formerly supposed.

Etiology.—In some of the cases recorded there seems to have been a history of local inflammatory disorders in the pharynx, existing some time before the development of the malignant disease. That this had any influence in the subsequent changes can scarcely be supposed.

Curiously enough, we find that the large majority of cases occur in females. Of those cases in which the sex is reported, seventeen were females, while but seven were males.

It is somewhat interesting to note the early period of life in which malignant disease of the pharynx develops. In the fourth decade of life, between thirty and forty-three cases were reported; in the fifth decade, ten cases; in the sixth and seventh decade, three cases in each; while in the eighth decade but one is reported.

In some of the cases there was the usual history of heredity, which, however, adds nothing new to our knowledge of the disease.

Pathology.—The prevailing type of carcinoma which is observed in the pharynx is epithelioma. In none of the cases reported has any other form of disease been specified, although in some instances the neoplasm was reported simply as cancer.

Its development would seem to follow the ordinary course of this

form of malignant disease when met with in the fauces, viz., to develop somewhat rapidly into ulceration, with the usual concomitants of that complication, viz., mild hemorrhagic attacks or bloody discharges.

As regards extension, in most instances this seems to have been downward, although in one case the reverse was true, the disease commencing in the upper portion of the lower pharynx and extending upward toward the pharyngeal vault. The pharynx belonging essentially, from an anatomical point of view, to the food tract, we should naturally expect any extension of malignant disease in this region to invade the œsophagus. This is reported to have occurred in ten of the cases given, while in six cases the larynx was invaded. In one instance both the larynx and œsophagus were invaded.

With the exception of a few of the cases reported, there seems to have been no tendency to generalization of the disease so far as an invasion of other organs is concerned, although the cervical glands in most instances seem to have been involved.

While secondary enlargement of the cervical glands is an almost constant attendant of the disease, it does not seem in most of the cases to have played any very important part as complicating the primary neoplasm.

Symptomatology.—As a rule, the earliest symptoms of the disease seem to have been insidious, the tumor commencing in one or the other lateral walls of the pharynx, and, growing by somewhat slow progress, gave rise to but slight interference with the functions of the parts, especially with reference to deglutition. In no case, so far as I know, was pain or hemorrhage a symptom of the earlier development of the disease. After the tumor has been present for some months, however, it seems to be the usual history, in many cases certainly, that it should take on a somewhat rapid growth, increasing in size, while at the same time new symptoms are developed with reference to mechanical interference with function, as well as pain and secretion. The tumor, developing in size, of course, more markedly hampers the function of deglutition, this being rendered exceedingly difficult or impossible for solids. The neoplasm extends now not only by projecting forward, but laterally, in such a way that the flexibility of the pharyngeal walls is destroyed; hence the impairment of deglutition is not purely due to the mechanical obstruction of the tumor, but to the fact that the muscular tissues of the pharynx are practically destroyed.

If the tumor extend upward, as occurred in a few instances, the symptoms are mainly confined to those with reference to deglutition and impairment of voice, while in the later stages ulceration takes

place, with its attendant secretion and attacks of hemorrhage. In no case reported has serious hemorrhage taken place from ulceration and destruction of arterial coats, such as we have seen to be the case in cancer of the tonsil; but the hemorrhage consists simply in oozing apparently from the ulcerated surface.

When the disease extends downward it seems to attack indifferently the larynx, the œsophagus, or both. When the former occurs, the additional symptoms of dyspnœa, with impairment or loss of voice and cough, are added.

From a practical point of view, so long as the malignant disease confines itself to the pharynx the symptoms are mainly interference with function, hypersecretion, and in the later stages pain with slight hemorrhages. Curiously enough, however, even in advanced cases, pain referable to the region does not seem to be a very constant symptom when the parts are at rest, although it is present to a more or less distressing extent in the attempt at deglutition, which, especially after ulceration has taken place, becomes quite painful.

Diagnosis.—In the earlier stages of the disease, before the tumor has assumed decided proportions, it would seem that a diagnosis would be exceedingly difficult. A local inflammatory area, perhaps, may possess a diagnostic significance.

As the neoplasm enlarges, it presents to ocular inspection the ordinary appearances of an epitheliomatous growth, namely, a broad, somewhat flattened, infiltrated plaque of mucous membrane, of a whitish-gray color, with perhaps a suggestion of pink, and a notable inflammatory area of redness around it—this latter appearance being one of no little diagnostic value. On palpation, the mass presents to the touch the peculiar and characteristic hardness of carcinomatous infiltration, with a smooth, unbroken surface.

The next stage of the disease consists in the development of ulceration, which is liable to occur quite early in the history of the disease. An epitheliomatous ulcer presents appearances which are not easily mistaken. The whole mass projects above the surface of the mucous membrane, while its central portion is usually depressed. It is ragged, of a yellowish-gray dirty color, and covered with a somewhat scanty, slightly opaque serum ordinarily tinged with blood, whose source is in the eroded capillaries.

The further diagnostic points are dependent upon the symptoms, the early development of glandular enlargement, and finally on the removal of a small portion for examination under the microscope.

Prognosis.—The pharynx must be regarded as a region in which malignant disease shows exceedingly fatal tendencies. This can be explained, in part certainly, by the fact that a cancerous neoplasm

here encroaches very early upon the food tract, and in many cases upon the air tract. The result of this is that the general health becomes notably impaired somewhat early in the history of the disease. The exceeding gravity and fatality of the disease, I think, are very clearly indicated by the cases reported. Thus, of fifteen in which the histories are sufficiently complete to afford definite data, the average duration of life from the commencement of the disease until death occurred was but nine and a half months. The longest time which any patient survived was about twenty months, while in the majority of instances the patients lived but from three to eight months after the disease had set in. Of these fifteen cases, however, seven were operated on, while eight were not. In the latter the average duration of life was eight and a half months, while the average duration of life in the cases operated upon was ten and a quarter months.

Treatment.—The indications for treatment have already been shown with sufficient clearness in the discussion of the other features of carcinoma of the pharynx; hence no suggestions further need be made.

SECTION V.

DISEASES OF THE LARYNX.

DISEASES OF THE LARYNX.

CHAPTER LXXIII.

THE ANATOMY OF THE LARYNX.

The cartilaginous framework which with its contents constitutes the larynx is superimposed upon the tracheal rings, and practically consists of such a modification of these rings as fits it for the performance of its special function, namely, that of phonation. At the same time, the phonatory apparatus is so arranged that the larynx shall constitute a free and unimpeded channel for the current of air in inspiration and expiration.

Cartilages.—The frame of the larynx (see Fig. 113) is composed of five principal cartilages, namely, the thyroid, the cricoid, the epiglottis, and the two arytenoids. In addition to these, we find two small supplementary cartilages on each side, those of Santorini and those of Wrisberg.

The Cricoid (see Figs. 114, 115).—The cricoid is the foundation cartilage of the larynx, in that all the other portions rest upon it. It is practically the upper ring of the trachea, but so modified, thickened, and enlarged as to afford a support to the other laryngeal cartilages and attachment of muscles. In shape, it bears a close resemblance to a seal ring, from which it derives its name. Its anterior half is small, rounded, and convex, and affords attachment to the crico-thyroid muscles. The posterior half is the broad, expanded portion, corresponding to the seal of the ring. The upper surface of this portion is marked by two facets, for articulation with the arytenoid cartilages, the long diameter of these facets lying transversely. On the outer portion of this half of the cartilage are found two small depressions, which mark the points of articulation with the inferior cornua of the thyroid cartilage.

The under surface of the cricoid is attached to the upper ring of the trachea. Its upper surface in front affords attachment to the

crico-thyroid membrane, and at the sides to the lateral crico-arytenoid muscles or glottis closers. The posterior surface of the expanded portion of the cartilage presents a ridge in the median line, which affords attachment to the fibrous tissue of the œsophagus, while on either side of this ridge there are shallow depressions, into which are inserted the fibres of the posterior crico-arytenoid muscles or glottis openers.

The Thyroid (see Fig. 116).—The thyroid cartilage consists of two broad, flat, quadrilateral plates, as it were, united anteriorly at a somewhat sharp angle,

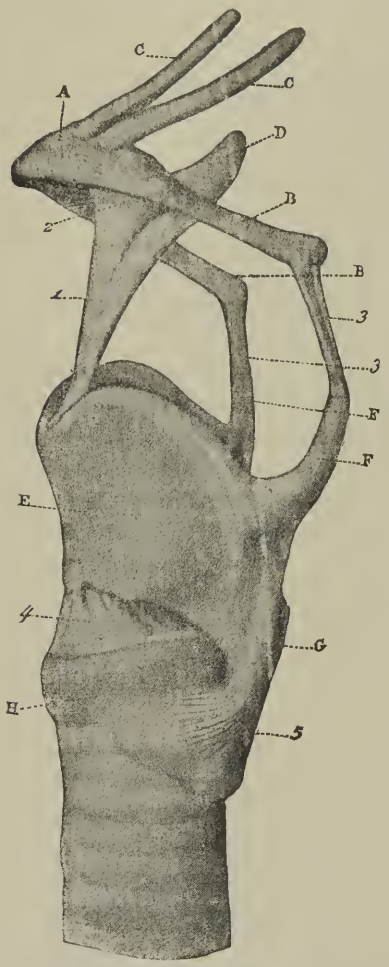

Fig. 113.—The Cartilaginous Frame of the Larynx, with the Hyoid Bone and Ligamentous Attachments (Broca). *A*, Hyoid bone; *B*, *B*, the greater cornua of the hyoid: *C*, *C*, the lesser cornua of the hyoid; *D*, epiglottis; *E*, thyroid cartilage; *F*, *F*, the superior cornua of the thyroid; *G*, the lesser cornu of the thyroid; *H*, cricoid cartilage; 1, thyro-epiglottic ligament; 2, hyo-epiglottic ligament; 3, lateral thyro-hyoid ligament; 4, median crico-thyroid ligament; 5, lateral crico-thyroid ligament.

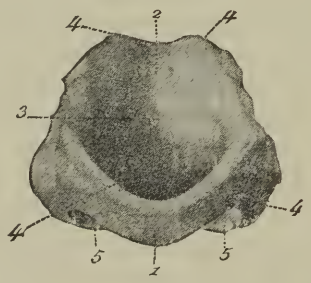

Fig. 114.—The Cricoid, seen Anteriorly (Broca). 1, Anterior portion; 2, posterior portion; 3, internal surface; 4, superior circumference; 5, inferior border.

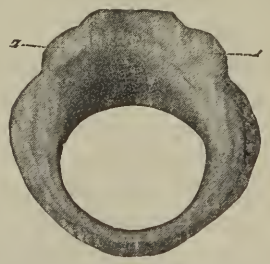

Fig. 115.—The Cricoid, Upper Surface. 1, 1, Articular facets for the arytenoid cartilages.

thus constituting a broad protruding shield, which forms a large portion of the anterior and lateral walls of the larynx, and

thus affords ample protection from external violence. The junction of the two broad plates or wings which form this cartilage is marked anteriorly and above by a deep sulcus or notch, the thyroid notch. The posterior border of each ala is marked by two prolongations above and below, the superior and inferior horns or cornua. The upper cornua afford attachment to the thyro-hyoid ligament, while the inferior cornua articulate with the cricoid cartilage, thus forming the only articular junction between the two cartilages, although the attachment is completed by means of the crico-thyroid ligament and the crico-thyroid muscles.

At the receding angle of the thyroid cartilage internally we find attachments, in the median line above, to the ligament of the epi-

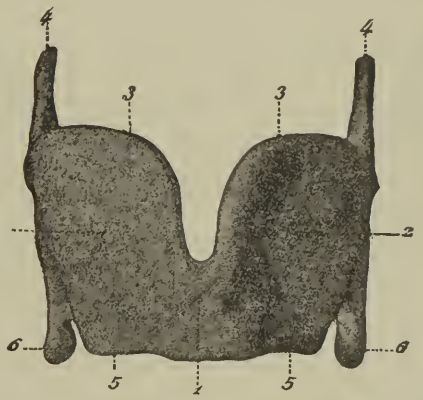

FIG. 116.—The Thyroid, Anterior Aspect (Broca). 1, Pomum Adami; 2, 2, quadrilateral surface of each ala; 3, 3, superior border; 4, 4, superior cornua; 5, 5, inferior border; 6, 6, inferior cornua.

glottis, while immediately below this, on either side of the median line, are the attachments of the ventricular bands, and below these that of the vocal cords. Immediately without the point of attachment of the vocal cords are the points of insertion of the thyro-arytenoid muscles. The posterior border of each ala affords attachment to the stylo-pharyngeus muscle, while immediately in front of these, and on the outer surface, are found successively the attachments of the inferior constrictor, the sterno-thyroid, and thyro-hyoid muscles; while on the lower portion of the outer face of each ring is found the attachment of the crico-thyroid muscle.

The Arytenoids (see Figs. 117, 118).—The arytenoid cartilages are so named from their resemblance to the mouth of a pitcher. They are small, three-sided pyramids, resting by their bases upon the upper surface of the posterior portion of the cricoid ring. The cartilages are so situated that the internal faces of each are nearly par-

allel. The anterior angle of each is prolonged, and receives the attachment of the vocal cord, while into the external angle of the base of each are inserted both the posterior and lateral crico-arytenoid muscles. The base of each cartilage presents a broad, oval depression, for articulation with the facet already described on the superior margin of the posterior portion of the cricoid cartilage. This depression is much larger than the facet with which it articulates, thus allowing great freedom of motion.

The apex of each of these cartilages is pointed, and bent slightly inward and backward.

The Cartilages of Santorini (see Figs. 117, 118).—In the mucous membrane immediately over the apex of each arytenoid cartilage are

Fig. 117.—Anterior Face of the Arytenoid (Broca). 1, 2, 3, Facets for the insertion of the ventricular band; 4, antero-internal angle of base or of vocal process; 5, caput Santorini.

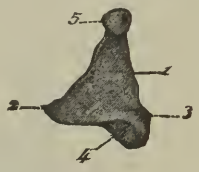

Fig. 118.—Posterior Face of the Arytenoid (Broca). 1,. Facet for the insertion of the ventricular band; 2, antero-internal angle of the base, the point of insertion of the vocal cord; 3, point of insertion of the posterior and lateral crico-arytenoid muscles; 4, facet for articulation with the cricoid; 5, caput Santorini.

found ordinarily two small fibro-cartilaginous nodules, called the cornicula laryngis or cartilages of Santorini, which are of interest mainly from an anatomical point of view.

The Cartilages of Wrisberg.—In each fold of mucous membrane which stretches from the arytenoid cartilages to the sides of the epiglottis, namely, the ary-epiglottic fold, at about one-third the distance from the arytenoids, there is found a slender, staff-like fibro-cartilage, the staff of Wrisberg, which is recognizable by a slight projection in the fold, immediately in front of the caput Santorini. This cartilage also seems to possess no special function in the human economy.

The Epiglottis.—This is a thin plate of fibro-cartilage, shaped somewhat like a leaf, rounded above, and terminating below in a somewhat elongated pedicle, called the petiolus, which is attached to the receding angle of the thyroid cartilage, immediately below the notch, by means of a ligamentous band, the thyro-epiglottic ligament, in such a way as to allow the largest freedom of antero-lateral movement. Its anterior surface is convex from side to side, and

concave from above downward, its superior border, as a rule, being curved forward over the base of the tongue, to which it is attached at its lower part in the median line by a band of fibrous tissue, the glosso-epiglottic ligament, while laterally the mucous membrane is thrown into two smaller folds, usually called the lateral glosso-epiglottic ligaments, although, according to Collier, no ligamentous tissue is found in these folds. The lingual face of this cartilage is studded with a number of minute depressions, which mark the site of the muciparous glands. The ary-epiglottic folds are attached to the sides of the cartilage.

During the act of deglutition, the larynx is drawn up beneath the base of the tongue in such a manner that the epiglottis is drawn over the opening of the larynx, something after the manner of a trap-door, thus preventing the entrance of food into the air passages. It was formerly supposed that this trap-door function of the epiglottis was indispensable. Clinical experience teaches us, however, that the constrictors of the larynx exclude food from the air passages, even when the epiglottis is entirely destroyed by disease.

In addition to the above cartilages, Luschka has discovered in the larynx several small cartilaginous structures which, although not invariably present, possess a certain amount of interest. These are the posterior sesamoid cartilages, small oblong masses between the arytenoids and the cartilages of Santorini, to which they are attached by delicate bands of ligamentary tissue; and the anterior sesamoid cartilages, located in the anterior portion of the vocal cords, where they are inserted into the receding angle of the thyroid. They are minute in size, and separated from the thyroid cartilage by a layer of dense fibrous tissue. The inter-arytenoid cartilage is a small cartilaginous mass found, very rarely, between the arytenoids.

Ligaments (see Fig. 113).—Outside of the larynx we find the thyroid cartilage connected with the hyoid bone by means of the thyro-hyoid membrane and the two lateral thyro-hyoid ligaments.

The thyro-hyoid membrane is a broad layer of fibro-elastic tissue, which extends from the upper border of the thyroid cartilage to the upper border of the hyoid bone, being separated from the inner surface of the latter by a synovial bursa. It is pierced in the median line by the superior laryngeal vessels and nerve.

The lateral thyro-hyoid ligaments are rounded, cord-like bundles of fibro-elastic tissue, which extend from the superior cornua of the thyroid cartilage to the greater cornua of the hyoid bone. A still further ligamentous connection between the hyoid bone and the larynx is found in *the hyo-epiglottic ligament*, a band of fibro-elastic tissue, which arises from near the apex of the epiglottis, and is inserted into

the posterior surface of the body of the hyoid. The laryngeal cartilages themselves are bound together by a series of ligaments, which are usually spoken of as internal or intrinsic ligaments. The thyroid cartilage is connected with the cricoid by means of three ligaments, the crico-thyroid membrane and the capsular ligaments.

The crico-thyroid membrane is a thick, elastic membrane which fills in the gap left between the upper border of the cricoid and the lower border of the anterior portion of the thyroid cartilage. Laterally it becomes blended with the anterior insertion of the true vocal cords. In the median line it lies directly beneath the skin, while laterally it is covered by the crico-thyroid muscles. It is crossed horizontally by a small arterial branch, forming an anastomosis between the crico-thyroid arteries of either side. On its inner surface the central portion is simply covered by the mucous membrane, while laterally it is covered by the thyro-arytenoid and lateral crico-arytenoid muscles. The connection between the thyroid and cricoid cartilages is completed by the articulation of the inferior cornua of the thyroid with the sides of the cricoid. This is enclosed by a capsular ligament, within which is found a synovial membrane.

Each crico-arytenoid joint is reinforced by loose capsular ligaments, within which are synovial membranes. Posteriorly, however, the capsule is strengthened by a *posterior crico-arytenoid ligament.*

The epiglottis is connected with the receding angle of the thyroid cartilage by means of *the thyro-epiglottic ligament*, a long, rounded, flexible bundle of fibro-elastic tissue. The epiglottis is also attached to the base of the tongue by *the median glosso-epiglottic ligament* and by two lateral folds, which, as we have seen, contain no ligamentous tissue other than the continuation of the pharyngeal aponeurosis.

The Cavity of the Larynx (see Fig. 119).—In examining the laryngeal cavity, commencing from above downward, we first come upon the crest of the epiglottis, lying in the median line at the base of the tongue. This presents a more or less crescentic shape, but varies within the limits of normality in a very marked degree. The crest may present as the arc of a comparatively large circle, or it may be bent on itself to such an extent as to present the outline almost of a shepherd's crook, this latter condition being more characteristic of early life. As a rule, of course, the centre of the epiglottis is in alignment with the median line of the body, although not infrequently we meet with a considerable deviation to one side. This does not, however, constitute a morbid condition. Beyond the epiglottis we come upon the cavity of the larynx. This is bounded above by a plane sloping downward and backward from the crest of the epiglottis to the apices of the arytenoid cartilages above, and

below by a plane passing through the lower border of the cricoid cartilage. The entrance to the larynx is somewhat triangular in shape, and is bounded in front by the epiglottis, laterally by two folds of mucous membrane, which stretch from the sides of the epiglottis

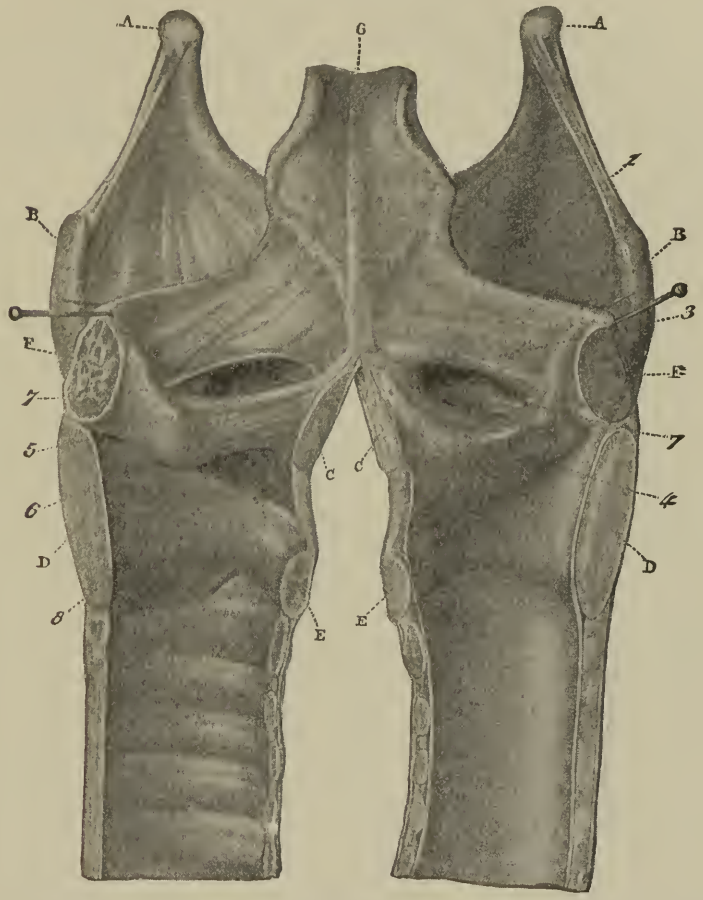

FIG. 119.—Antero-Posterior Section of Larynx, showing the Cavity after the Removal of the Mucous Membrane from Left Lateral Half (Broca). *A*, *A*, Hyoid bone; *B*, *B*, greater cornua of thyroid; *C*, *C*, section of thyroid at commissure; *D*, *D*, cricoid cartilage divided posteriorly; *E*, *E*, anterior section of cricoid; *F*, *F*, arytenoideus muscle divided; *G*, posterior surface of epiglottis; 1, ary-epiglottic fold; 2, muscular fibres in the fold; 3, ventricular band; 4, true cord; 5, ligamentous portion of same; 6, thyro-arytenoid muscle; 7, ventricle; 8, internal surface of the crico-thyroid muscle.

to the arytenoid cartilages, viz., the aryteno-epiglottidean folds. The laryngeal cavity is divided into two portions by the vocal cords, the opening between which is called the rima glottidis. That portion above the vocal cords is called the supraglottic portion, while that below is called the subglottic portion.

Immediately below the crest of the epiglottis is found a rounded prominence, *the cushion of the epiglottis*. This is really due to the prominence of the petiolus, although there is a certain amount of adenoid tissue, together with fatty matter, found at this point. Passing from the side of the epiglottis to the apex of each arytenoid cartilage is a fold of mucous membrane, *the ary-epiglottic fold*, which is supported by ligamentous and muscular fibres. At the edge of this fold, immediately over the arytenoid, may be seen the prominence formed by the cartilage of Santorini, and in front of this the projection of the cartilage of Wrisberg.

Passing farther down into the cavity of the larynx, we come upon two folds of mucous membrane, one on either side, *the ventricular bands*, which extend in a horizontal plane from the receding angle of the thyroid to the arytenoid cartilages. These bands or folds of mucous membrane are supported by the superior thyro-arytenoid ligaments, bands of elastic tissue whose attachments in front are on either side of the receding angle of the thyroid immediately below the attachment of the epiglottis, while posteriorly they are attached to the interior surface of the arytenoid cartilages. Immediately below the ventricular bands, or false vocal cords as they are sometimes called, is found on either side an oblong or elliptical fissure which separates them from the true vocal cords. These fossæ extend nearly the whole length of the vocal cords and the ventricular bands, and are called *the ventricles of the larynx*. They are bounded externally by the thyro-arytenoid muscles. In the anterior part of each ventricle is found a narrow, pouch-like cavity, lined with mucous membrane, *the sacculus laryngis*. This is a membranous sac, which extends up between the ventricular band and the inner surface of the ala of the thyroid cartilage. It curves upward and backward, and is said to resemble in form a Phrygian cap. It varies greatly in depth in different persons, and occasionally is found extending as far as the upper border of the thyroid, and in rare instances it has been traced beyond the epiglottis to the base of the tongue. A large number of muciparous glands are found in the sacculus, which has led to the theory that this cavity constitutes a lubricating reservoir for the vocal cords. It is more probable, however, that it is merely a rudimentary survival of organs which obtain an enormous development in the quadrumana, reaching even to the shoulders and axillæ.

Immediately below the ventricular bands and parallel with them are found *the true vocal cords*. These are two stout fibrous bands composed of yellow elastic tissue. Anteriorly they are inserted into the lower portion of the receding angle of the thyroid cartilage, immediately within the insertion of the thyro-arytenoid muscles. Pos-

teriorly they are divided into three sets of fibres, one of which is inserted into the anterior angle or vocal process of the arytenoid cartilage; a second portion is inserted into the anterior face of the same cartilage, as high up as the ventricular bands; while a third is inserted into the capsular ligament which invests the crico-arytenoid joint, and also into the anterior face of the expanded portion of the cricoid ring. A cross-section of the vocal cord shows it to be a triangular prism, the apex of which presents to its fellow, while the base presents outward, and affords attachment in its whole length to the fibres of the thyro-arytenoid muscle. We thus find the vocal cord to be practically a ligamentous border of this latter muscle. *The glottis* or *rima-glottidis* is the name given to the opening between the true vocal cords. In the male its length varies somewhat, but the average, probably, in the adult male is about seven-eighths of an inch. Anteriorly, of course, the cords are in contact. Posteriorly, when dilated to its widest extent, the opening will measure about a half-inch.

An anomalous condition of the vocal cords is occasionally met with, which consists in a union which, commencing at the anterior commissure, extends backward from a quarter to half the distance to the arytenoid. This is usually described as a web of the vocal cords. It is a congenital condition, and consists in a union of the mucous membrane probably, rather than of the fibro-elastic tissue.

The Muscles.—Various classifications have been made of the muscles which preside over the movements of the larynx, based both on physiological and anatomical investigation. Any classification which restricts each individual muscle to a particular function is to an extent misleading. They are presented here, therefore, without grouping.

The most important muscles of the larynx and those which act directly upon the vocal cords are: the crico-thyroid, the crico-arytenoideus posticus, the crico-arytenoideus lateralis, the thyro-arytenoideus, and the arytenoideus.

The Crico-Thyroid (see Fig. 120).—The crico-thyroid is a triangular-shaped muscle, which arises from the anterior portion and side of the cricoid ring and divides into two fasciculi, one of which passes almost directly upward, to be inserted into the inner portion of the lower border of the thyroid cartilage anteriorly, while the other fasciculus passes obliquely upward and backward and is inserted into the lower border of the thyroid cartilage, immediately behind the insertion of the first fasciculus.

It was formerly supposed that this muscle, acting from the cricoid as a fixed point, drew the thyroid down over it in such a way as

to produce tension and elongation of the vocal cords. Elaborate series of investigations have shown conclusively that the thyroid is the fixed point, being rendered so by the action of the thyro-hyoid, ster-

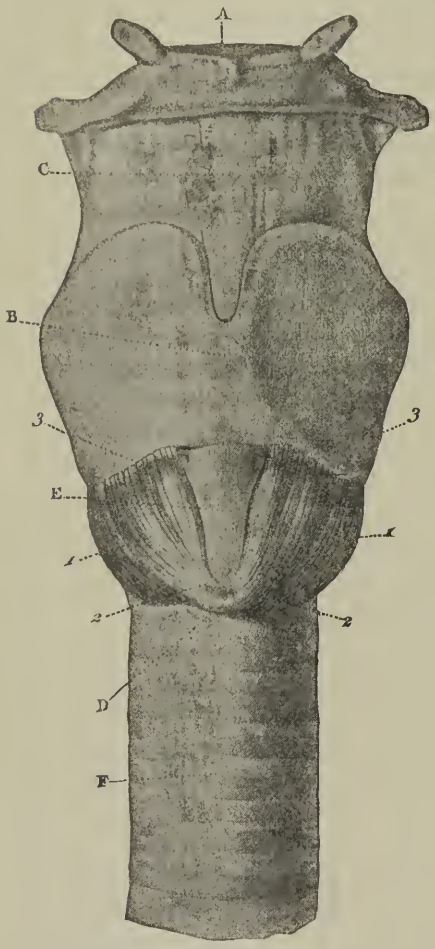

FIG. 120.—The Crico-Thyroid Muscle, Viewed Anteriorly (Broca). *A*, Hyoid bone; *B*, thyroid cartilage; *C*, thyro-hyoid membrane; *D*, cricoid cartilage; *E*, crico-thyroid membrane; *F*, trachea; 1, 1, crico-thyroid muscle; 2, 2, origin of the muscle from the anterior portion and side of the cricoid; 3, 3, insertion into the lower border of the thyroid.

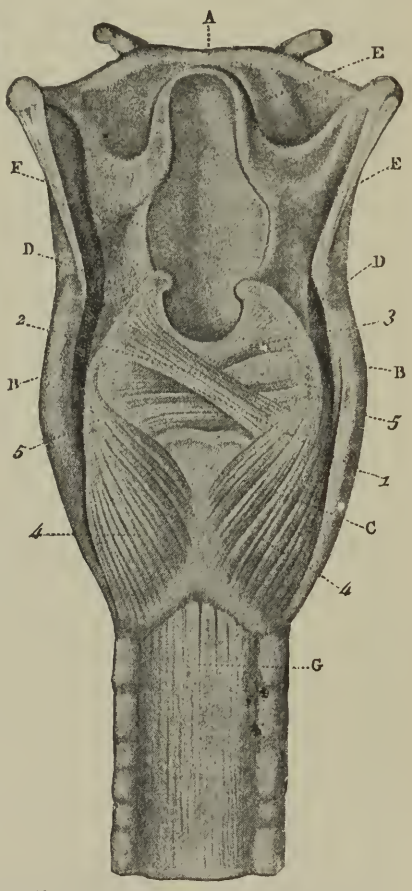

FIG. 121.—The Arytenoid and Posterior Crico-Arytenoid Muscle (Broca). *A*, Hyoid bone; *B*, *B*, posterior border of the thyroid; *C*, posterior face of cricoid; *D*, *D*, posterior border of the arytenoid; *E*, epiglottis; *F*, *F*, ary-epiglottic folds; *G*, trachea; 1, arytenoid muscle; 2, 3, oblique fibres of same; 4, 4, crico-arytenoid posterior muscles; 5, 5, their insertion in the outer angle of the base of the arytenoid cartilage.

no-thyroid, and laryngo-pharyngeal muscles, and the cord is elongated and rendered tense by the cricoid being drawn upward and backward.

The Posterior Crico-Arytenoid (see Fig. 121).—The posterior crico-arytenoid muscles are somewhat triangular in shape, and arise from the posterior surface of the expanded portion of the cricoid cartilage, and have their insertion in the outer angle or muscular process of the base of the arytenoid cartilage. The action of each muscle, having its fixed point on the cricoid cartilage, is to draw the outer angle of the arytenoid cartilage backward, thus throwing its anterior angle or vocal process, to which is attached the vocal cord, outward, in this way acting as a glottis-opener (see Fig. 122). According to Ruhlmann, each of these muscles is composed of two fasculi, the outermost or more horizontal fibres acting to draw the whole of the aryte-

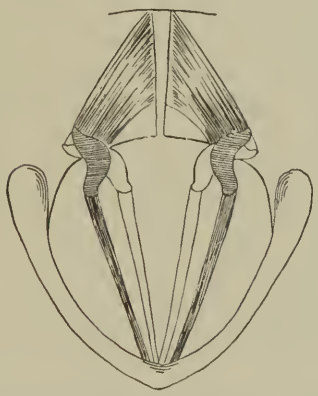

FIG. 122.—The Glottis-Opening Action of the Posterior Crico-Arytenoid Muscles, shown by Diagram.

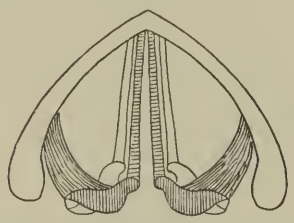

FIG. 123.—The Glottis-Closing Action of the Lateral Crico-Arytenoid Muscles, shown Diagramatically.

noid cartilage directly outward, away from its fellow, while the inner and lower fibres rotate it on its base.

The Kerato-Cricoid Muscle.—Merkel describes a bundle of muscular fibres which arises at the side of the cricoid origin of the posterior crico-arytenoid muscle, and is inserted into the posterior portion of the lower horn of the thyroid. He gives it the name of the kerato-cricoid muscle. Merkel states that it is unilateral, although Turner says that it is occasionally bilateral, and is found in twenty-one and eight-tenths per cent of cases.

The Lateral Crico-Arytenoid.—These muscles have their origin on the upper border of the side of the cricoid cartilage, and, passing upward and backward, are inserted into the outer angle or muscular process of the arytenoid cartilage, immediately in front of the insertion of the preceding muscle. Having their fixed point in the cricoid they draw the outer angle of the arytenoid cartilage forward, thus throwing its vocal process inward and closing the glottis (see Fig. 123).

The Thyro-Arytenoid.—These muscles have their origin in the lower portion of the receding angle of the thyroid cartilage and the crico-thyroid membrane, and, passing backward along the outer side of the vocal cords, are inserted into the base and anterior surface of the arytenoid cartilage. Each muscle is composed of two fasciculi, the inferior and superior, or, as they are ordinarily called, the internal and external. Each fasciculus arises from the receding angle of the thyroid. The internal passes backward and is attached to the vocal cord in its whole length, while posteriorly it is inserted into the external surface of the vocal process; the external fasciculus spreads out more widely, and is inserted into the anterior face of the arytenoid cartilage, as far outward as the muscular process. The fibres of this fasciculus pass under the sacculus laryngis. The action of this muscle as a whole is to approximate the arytenoid cartilages to the thyroid, thus shortening and relaxing the vocal cords. The action of the internal fasciculi is to bring the edges of the cords together, and they thus have an important function in the production of the high notes in the singing voice, while the external fasciculi have mainly to do with relaxation of the cords, and are also supposed to have a function in compressing the sacculus laryngis.

The Superior Thyro-Arytenoid.—In addition to the above, Schrötter describes a bundle of muscular fibres which he designates as the superior or oblique thyro-arytenoid muscle, which, having its origin near the receding angle of the thyroid, just above the former muscle, passes backward, outward, and downward, and is inserted into the muscular process of the arytenoid cartilage. It serves to re-enforce the action of the former muscle, especially in the finer movements of the singing voice.

The Arytenoid.—The arytenoid is a single muscle which passes from the posterior surface and outer border of one arytenoid cartilage to the corresponding part of the opposite cartilage. It is usually described as composed of three layers, two oblique and one transverse. The oblique fibres pass from the apex of one cartilage to the base of the opposite, and conversely. The transverse fibres, which are the deepest, pass directly across in a horizontal direction from one cartilage to the other. A better anatomical division would be to describe the transverse fibres alone as composing the arytenoid muscle, while the oblique fibres belong to the ary-epiglottic muscles. The action of the arytenoid muscle is to approximate the artyenoid cartilages, and to close that portion of the rima glottidis which is included between the vocal processes.

The Thyro-Epiglottic and Ary-Epiglottic Muscles.—The muscles above described have their principal action upon the vocal cords. In

addition to this, we have two muscles which act upon the epiglottis and the opening of the larynx, viz., the thyro-epiglottic and the ary-epiglottic muscles.

The thyro-epiglottic has its origin at the side of the receding angle of the thyroid cartilage, immediately external to the thyro-arytenoid muscle; it passes outward around the sacculus laryngis, and is inserted into the sides of the epiglottis, some of its fibres being lost in the ary-epiglottic fold. This muscle is supposed to act as a depressor of the epiglottis.

The ary-epiglottic muscle arises from the posterior surface of the base of the arytenoid cartilage, and passes up in an oblique direction to the apex of the opposite arytenoid, to which it is loosely attached, and then passes forward in the ary-epiglottic fold, in which some of the fibres are lost, while others pass forward and upward over the inner and upper portion of the sacculus laryngis, and are inserted by a broad attachment into the margin of the epiglottis, some of its fibres spreading on to its anterior surface.

This muscle, therefore, with its fellow, makes almost a complete girdle around the entrance of the larnygeal cavity. In contraction, its action is necessarily to constrict the aperture of the larnyx, while at the same time probably some of its fibres act to compress the sacculus laryngis.

The Sterno-Hyoid and Thyro-Hyoid Muscles.—In addition to the above there are certain muscles, usually described as belonging to the infrahyoid region, which should be described in this connection, in that they possesss a somewhat important function in fixing the larynx during phonation. These are the sterno-thyroid and thyro-hyoid. The sterno-thyroid arises from the posterior surface of the manubrium of the sternum, and occasionally from the cartilage of the first rib, and has its insertion in the side of the wing of the thyroid cartilage; while the thyro-hyoid arises from the side of the wing of the thyroid cartilage, immediately above the insertion of the sterno-thyroid, and, passing upward, is inserted into the lower edge of the body and great wing of the hyoid bone. The action of the sterno-thyroid, therefore, would seem to be to depress the larynx, while the thyro-hyoid elevates it. The two muscles, however, acting in harmony, subserve the purpose of steadying the larynx during phonation, and thus enable the intrinsic muscles of the larynx to perform their function in phonation with a greater degree of nicety. This function is also aided somewhat by certain small muscular fibres, to which the name of *the laryngo-pharyngeal muscle* is given, which have their origin from the posterior border of the cricoid cartilage, and,

passing backward round the pharynx, are inserted into the body of the fourth or fifth cervical vertebra behind.

The Mucous Membrane.—The mucous membrane which lines the larynx is continuous with that of the pharynx and oral cavity above and with that of the trachea below. It covers both the anterior and posterior surfaces of the epiglottis, to which it is closely adherent, and is then reflected over the ary-epiglottic muscle, forming the ary-epiglottic fold, and subsequently over the superior thyro-arytenoid ligament, from which it passes into and forms the lining of the sacculus laryngis, and thence passes over the true vocal cords, where it

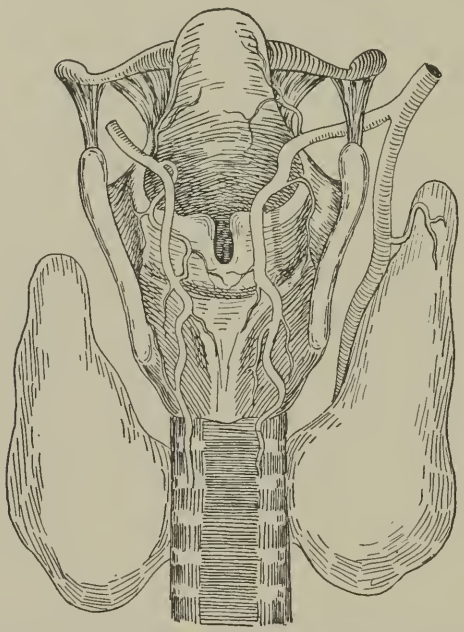

Fig. 124.—Arterial Supply of the Larynx, Posterior View, showing the Distribution of the Superior Laryngeal Artery.

forms an exceedingly thin and closely adherent membrane. Passing below the rima, it becomes continuous with the lining membrane of the trachea. Below the ventricular bands it follows the rule which governs mucous membranes lining the air tract, and is covered with columnar ciliated epithelium, with the exception of the true vocal cords, which are covered with squamous epithelium. Above the ventricular bands the ciliated epithelium is found on the lower half of the posterior face of the epiglottis. In the remaining portion the epithelium is of the squamous variety.

The Muciparous Glands.—The lining membrane of the larynx is

richly endowed with muciparous glands, which are especially numerous upon the posterior face of the epiglottis, along the posterior margin of the ary-epiglottic folds, and in front of the arytenoid cartilages, as well as in the sacculus laryngis.

Arteries.—The arterial supply of the larynx is derived from branches of the superior and inferior thyroid arteries, the superior thyroid being a branch of the external carotid, while the inferior is a branch of the thyroid axis. These laryngeal branches are divided into two sets, anterior and posterior. The anterior set consists of

Fig. 125.—Arterial Supply of the Larynx, Anterior View, showing the Distribution of the Inferior Laryngeal, with the Origin of the Superior Laryngeal Artery.

two branches, the superior laryngeal and inferior laryngeal, both branches of the superior thyroid artery.

The superior laryngeal (see Fig. 124) passes inward in connection with the superior laryngeal nerve, between the greater cornu of the hyoid bone and the upper border of the thyroid cartilage, and enters the larynx through the thyro-hyoid membrane, after passing beneath the thyro-hyoid muscle. It is distributed to the epiglottis and to the mucous membrane, muscles, and glands of the upper and anterior portion of the larynx.

The inferior laryngeal artery (see Fig. 124), or *the crico-thyroid* as it is often called, arises from the superior thyroid artery, almost immediately opposite the lower border of the thyroid cartilage, and

passes directly inward until it impinges upon the crico-thyroid membrane, where it divides into two branches, the lower of which anastomoses with a branch from its fellow of the opposite side, and, perforating the membrane, enters the larynx, and is distributed to the mucous membrane below the vocal cords. The upper branch, passing beneath the border of the thyroid cartilage, anastomoses with branches from the superior laryngeal artery. A small branch also passes up on the outer face of the thyroid cartilage, and anastomoses with twigs from the hyoid branch of the superior thyroid artery.

A second group is made up of *the posterior laryngeal artery*, which is a branch of the inferior thyroid. It passes upward in connection with the recurrent laryngeal nerve, until it reaches the posterior wall of the larynx near the crico-arytenoid articulation, where it divides into two branches, one of which is distributed to the posterior crico-arytenoid muscle, while the other passes upward, to anastomose with branches of the superior laryngeal artery. The course of the larger branches, as a rule, is quite close to the cartilaginous framework, while the smaller branches approach more nearly to the surface, where they are broken into a fine network.

Veins.—The veins of the larynx follow the general course of the arteries, and empty into the superior, middle, and inferior thyroid veins, which terminate in the internal jugular.

The Lymphatics.—The lymphatics of the larynx form a close network throughout the whole of its mucous membrane. They eventually unite to form two main trunks on either side, viz., one above each ventricle and one below the cricoid cartilage. The upper trunk is formed by a union of the lymphatic vessels which are distributed to the epiglottis, and that portion of the larynx which is above the vocal cords, and passes out from the cavity, above the superior border of the thyroid cartilage, and empties into the lymphatic glands which lie on either side of the larynx, near the anterior border of the sterno-mastoid muscle. The lower trunk is formed by a union of the lymphatic vessels which are distributed to the mucous membrane below the glottis, and, emerging from the larynx below the border of the thyroid cartilage, empties into the lymphatics distributed on either side of the trachea. These lymphatic trunks, as we have designated them, are made up of a group of several distinct vessels. The lymphatic distribution in the supraglottic portion of the larynx is exceedingly rich, while in the mucous membrane covering the cords and in the subglottic portion of the larynx it is somewhat diminished.

Lymphatic tissue, according to Luschka, is not found diffused beyond the mucous membrane of the larynx, but only at the borders of

the epiglottis and in the ary-epiglottic folds. Rheiner believed that the presence of this tissue was an evidence of a catarrhal condition; while Heitler has found it distributed not only to the ary-epiglottic folds, but also to the mucous membrane over the arytenoids, and especially over the cartilages of Santorini, in the inter-arytenoid and thyroid commissures, and in the anterior part of the laryngeal ventricles. So extensive is this aggregation of tissue in this last situation that Hill has given it the name of the laryngeal tonsil.

NERVES.—The larynx receives its motor and sensory innervation from the superior and the inferior or recurrent laryngeal nerves.

The superior laryngeal nerve is a branch of the pneumogastric, which, according to the accepted view, supplies general sensation to the mucous membrane, and motor innervation to the crico-thyroid muscle and possibly to the arytenoid muscle. It has its origin in the inferior ganglion of the pneumogastric, from whence it passes down by the side of the pharynx, and divides above the superior border of the thyroid cartilage into two branches, the external and internal laryngeal. The external branch passes down on the outer side of the larynx, and pierces the crico-thyroid muscle. The internal branch pierces the thyro-hyoid membrane in connection with the superior laryngeal artery, and is distributed over the whole of the mucous membrane lining the laryngeal cavity and also to the base of the tongue, supplying general sensation. A filament is also sent to the arytenoid muscle. It also joins the recurrent laryngeal nerve. The motor filaments which supply the crico-thyroid and arytenoid muscles probably have their origin in the spinal accessory nerves.

The inferior or recurrent laryngeal nerve supplies the muscles of the larynx with motor innervation, and is a branch of the pneumogastric, which it leaves, however, somewhat differently on either side. On the right side it arises on a level with the right subclavian artery, round which it winds from before backward, and then passes upward and inward, approaching the trachea. On the left side it rises on a level with the concavity of the arch of the aorta, and, passing around this vessel, from before backward, ascends until it approaches the trachea, when it passes upward in the sulcus between it and the œsophagus. The nerve on either side passes up immediately behind the point of articulation of the lesser horn of the thyroid cartilage with the cricoid, and enters the laryngeal cavity, giving off branches to the posterior crico-arytenoid muscle, and also, according to Von Ziemssen, sending sensitive branches which penetrate the muscles and are distributed to the mucous membrane of the laryngeal cavity below the glottis. As the nerve passes upward in the laryngeal cavity it distributes branches to the remaining muscles of the larynx, viz., the

lateral crico-arytenoid, the arytenoideus, the thyro-arytenoids, the thyro-epiglottic, and ary-epiglottic muscles.

The right recurrent nerve, after passing round the subclavian artery, is in close contact with the apex of the lung of that side, an anatomical fact which it is important to remember in the rare instances in which we meet with right recurrent paralysis.

The median laryngeal nerve, springing from the pharyngeal branch of the pneumogastric, is known to exist in some of the lower animals, and, while it has never been isolated in the human subject, Exner takes the ground that it is present, but so intricately involved in the pharyngeal plexus as to preclude an anatomical demonstration. He bases this view purely on physiological experimentation. According to this observer, all the muscles of the larynx, with the exception of the external thyro-arytenoid, receive motor innervation from more than one nerve—a fact which has been established by Mandelstamm, who has shown that all the muscles of one side of the larynx not only receive double innervation from the superior and inferior nerve, but also by a sort of cross-action from the nerves of the opposite side. Exner takes the ground that this double innervation of the muscles establishes a general law. The crico-thyroid muscle, however, can be shown to receive innervation only from the superior nerve. In order, therefore, to bring this muscle under the action of the general law of double innervation, he argues the existence of a median laryngeal nerve, supplying this muscle in connection with the superior.

We thus find the laryngeal muscles endowed with an unusually rich nerve supply. Exner goes still further, and states that there is a great variation in individuals as regards the distinct source of innervation in each special muscle; in other words, that in no two individuals, probably, is the distribution of the nerve fibres to the laryngeal muscles exactly alike. This view will serve to explain many of the curious features which are occasionally met with in cases of paralysis of the laryngeal muscles. Exner fails to bring the external thyro-arytenoid muscle under his general law of double innervation, although in many instances he demonstrates a cross-action here by which this muscle receives innervation from the recurrent nerves of both sides.

We are usually taught that the recurrent laryngeal nerve derives its motor fibres from the spinal accessory, and, moreover, that the spinal accessory is the sole source of motor innervation in the larynx. Onodi, however, takes the ground that the larynx receives motor fibres which have their source in the spinal cord as far down as the lower cervical and first dorsal spinal ganglia of the sympathetic system, the course of the fibres being directly from the spinal cord to the

first thoracic ganglion, then through the communicating branch between this and the last cervical ganglion, and from this directly to the recurrent nerve. This will demonstrate how a destructive morbid lesion of the ganglia of the spinal accessory nerve may occur without resulting in the complete paralysis of the larnygeal muscles, they still receiving a certain amount of motor innervation from the spinal cord in the manner shown by Onodi. In this connection it should be stated that the motor fibres which innervate the larynx, and which reach the recurrent nerve through the spinal accessory, have their origin in that root of the spinal accessory which rises in the medulla oblongata.

CHAPTER LXXIV.

THE PHYSIOLOGY OF THE LARYNX.

The larynx possesses two functions in the economy: It is endowed with certain movements constituting its respiratory function, and it also contains the mechanism by which the current of expired air is thrown into sonorous vibrations, which are subsequently converted into articulate language by means of the tongue, lips, cheeks, etc., thus constituting its function in phonation.

The Function of the Larynx in Respiration.

The general contour of the larynx in health is such that, while it opposes no obstacle whatever to the outgoing current of air in expiration, the ingoing current of air would be so far obstructed as to lead to serious consequences did not nature provide for the glottis being widely opened during inspiration, by muscular action. In other words, the tendency of the outgoing current of air is to open the glottis with little effort; the tendency of the ingoing current of air is to close it, the two vocal cords forming a valve, as it were, whose action is not unlike that of the mitral valves of the heart. With every act of inspiration, therefore, the glottis is opened by the posterior crico-arytenoid muscles. These muscles, as we know, arising from the posterior surface of the expanded portion of the cricoid ring, pass outward and upward for insertion into the outer angle or muscular process of the base of the arytenoid cartilage. By their contraction they turn the arytenoid on itself, drawing its outer angle backward, thus throwing its anterior angle outward and opening the glottis. The opening of the glottis is still further accomplished by the action of the outer fibres of this muscle, which act to draw the whole cartilage outward on the elliptical facet, which, as we know, runs transversely on the cricoid cartilage.

The respiratory function of the larynx, therefore, consists in this glottis-opening action of the posterior crico-arytenoid muscles. During the act of expiration muscular action is simply relaxed, and the expired current of air makes a passive exit from the lungs. This

glottis-opening movement is purely of a reflex character, and is presided over by the respiratory centre in the floor of the fourth ventricle. The action of this muscle is coincident with and excited by the same impulses which excite the ordinary muscles of inspiration.

The respiratory act is excited primarily by the influence of the current of deoxygenated blood passing through the respiratory centres, experiments having shown that the presence of carbonic acid in the venous blood passing through the medulla excites the respiratory act; and, furthermore, that as the carbonic acid increases these acts become more rapid and more vigorous.

The Function of the Larynx in Phonation.

The phonatory function of the larynx is exercised by an exceedingly simple mechanism, by means of which the respiratory current of air is partially arrested by the approximation of the vocal cords, and is then driven through the chink thus formed in such a way that the column of air is thrown into sonorous vibrations, which are subsequently converted into articulate language by the parts above. We thus find that, whereas the respiratory function of the larynx has to do with the current of air in inspiration, the phonatory function has to do with the current of air in expiration. The larynx is thus endowed with two functions, which, however, by an exceedingly simple and yet harmonious adjustment of mechanism, are performed without interference; in fact, the two functions seem to be supplementary to one another, the involuntary function of respiration being carried on during the intervals of the voluntary function of phonation.

The action of the larynx is really that of a reed instrument, and the column of expired air is thrown into sonorous vibrations by the vocal cords. For the accomplishment of this purpose the cords are brought into apposition in the median line, and held firmly in position and rendered tense by muscular action, when the air is forced through by the respiratory muscles of the chest in such a way as to throw the edges of the cords into vibration. In this manner the column of air in the upper air tract is also thrown into vibration, and, as has been stated, converted into articulate language by the movements of the tongue, lips, palate, etc. The muscles concerned in the approximation of the cords are primarily the lateral crico-arytenoid and the inter-arytenoid muscles, the former pulling forward the outer angle of the base of the arytenoid cartilages, thus rotating inward its anterior angle or vocal process, to which is attached the vocal cord, while the latter muscle simply brings into apposition the two arytenoid cartilages. The approximation of the cords is thus an exceed-

ingly simple matter and one clearly understood. The mechanism by which the cords are rendered tense, however, is somewhat complicated. The muscles which are concerned in this function are the crico-thyroid and the thyro-arytenoid muscles. The action of the crico-thyroid is quite evident; in drawing the cricoid cartilage upward and at the same time displacing it backward, the vocal cords are lengthened and rendered more tense. All authorities unite, I think, in the statement that the nicer tension of the cords is regulated by the thyro-arytenoid muscle. The apparent action of this muscle, passing as it does from the anterior face of the arytenoid cartilage to the receding angle of the thyroid, is by its contraction to approximate the two attachments of the vocal cord, and thus produce relaxation. We must remember, however, that this muscle is made up of a number of fasciculi which are attached to the vocal cord in its whole extent, the vocal cord really being an aponeurosis of the muscle, as it were. It is quite a mistake to think that high tension of the vocal cords involves the necessity of their being stretched to their utmost between the arytenoid cartilage and the receding angle of the thyroid, thus bringing their edges into absolute parallelism; more probably, the tension of the vocal cords involves their edges being held in a state of firmness and rigidity, whether the chink be a straight line or an oval opening. In this way, the greater the rigidity of the cord the higher the number of vibrations per second into which it is thrown by the action of a column of air forced through the opening, therefore the higher the pitch of the sound produced. The vocal cords being then stretched from before backward, and rendered tense in the median line by the action of the crico-thyroid muscles, the thyro-arytenoid, whose fibres are attached throughout their whole length to the outer border of the cord, acts not only to increase this tension, but to give it that fine adjustment which is especially necessary in the higher powers of phonation, viz., in the singing voice.

A still further action of the thyro-arytenoid muscle is that by the agency of those fibres which are distributed on the anterior face of the arytenoid and out toward the muscular process, the lateral crico-arytenoid muscle is re-enforced and the vocal processes approximated.

The tension of the cords is aided somewhat by the inter-arytenoid and lateral crico-arytenoid muscles, which act to steady and hold firmly the arytenoid cartilage on its base.

The epiglottis has been supposed by many to possess a certain function in phonation; but the true and main function of this cartilage undoubtedly is in closing the entrance of the larynx during the act of deglutition.

The voice is endowed with pitch, intensity, and quality. The

pitch of a voice depends solely upon the number of vibrations of the vocal cords. The greater the number of vibrations, of course, the higher the pitch. This is regulated entirely by the action of the muscles heretofore described. By the intensity of the voice is meant merely its loudness, which, of course, is dependent entirely on the amount of expiratory effort expended in driving the air through the chink of the glottis. The quality or timbre of the voice is that which gives each voice its special and individual character. This is largely dependent upon the general anatomy of the vocal apparatus, including the larynx, pharynx, nasal and accessory cavities.

Each one of these cavities possesses a fundamental note. This fundamental note is constant in all except the mouth, where, of course, it varies according to its form and the position of the soft parts within it.

Articulate speech is made up by a combination and modification of the elementary sounds, whose origin is largely in the larynx, yet not altogether, for, when we come to analyze carefully articulate speech, we find that it is only the vowel sounds which have their direct origin in the vibrations of the vocal cords, and that the consonants are formed by a modification or interruption of the expiratory blast in the throat, mouth, and nasal cavity. While the only sounds which are produced by the vocal cords are the vowel sounds, the peculiar characteristic of each vowel sound is the result of the positions which the mouth, tongue, and lips assume, this being different for each vowel. Furthermore, Helmholtz teaches us that the fundamental note of each vowel is invariable. In other words, that in the enunciation of each vowel sound the pharynx and mouth are placed in such a position that they form a cavity whose fundamental note is exactly the same for that vowel in all races and in all individuals.

Consonants are produced entirely in the oral cavity by interruptions or modifications of the expiratory blast. Consonants may be divided into labials, dentals, and gutturals, according to the point in the oral cavity at which the interruption or modification of the expiratory blast occurs; and these may further be divided into explosives, aspirates, and resonants, according to the manner in which the expiratory blast is interrupted or modified.

In the formation of the whispering voice the anterior portions of the vocal cords are in approximation, while posteriorly a triangular opening is left between the vocal processes, through which the outgoing current of air rushes with a slight sound, which is formed into articulate speech by the tongue, lips, etc. The pitch of the whisper is always the same for each vowel and cannot be changed, and therefore represents the fundamental note of the oral cavity in each instance.

Articulate speech, therefore, so far as the upper air passages are concerned, simply requires the integrity of innervation, motility, and contour of the larynx, pharynx, nasal and oral cavities, and lips. The tongue plays an exceedingly important part in the enunciation of most of the consonant sounds, and yet many cases have been reported in which the power of articulation was not seriously impaired after extirpation of the tongue.

In more or less complete destruction of the soft palate and uvula, or in obliteration of the palato-pharyngeal space, the tone of the voice is seriously modified, and yet articulation is not materially interfered with. In the loss of the palate or in cleft palate, the difficulty is not so much in the movements of articulation as in the fact that the air escapes through the nasal passages, the patient not being able to force sufficient between the lips for use in articulation. The lips, therefore, are the parts most markedly brought into use in the process of articulation, and hence anything which interferes with their motility more seriously hampers this faculty than a morbid condition of any of the other parts involved in the function.

The Singing Voice.—The ordinary conversational voice does not demand that the larynx and upper air passages shall be in a perfectly normal state; indeed, we find this organ not infrequently the seat of notable morbid lesion without impairment of the conversational voice.

In the use of the singing voice, however, it is not only essential that the larynx shall be normal in contour, properly innervated, and free from any inflammatory process, but that the whole upper air tract also shall be in a state of health.

Probably every healthy larynx possesses the capacity for singing; from a conventional point of view, however, we say that an individual possesses a singing voice who possesses the capacity of producing, by means of the larynx, the successive tones of the musical scale in such a manner as to afford an agreeable and harmonious impression to the ear. This faculty is not the natural endowment of the larynx, but one which is acquired only by practice or exercise. The idea of the singing voice, furthermore, involves the necessity of its possessing a certain range, usually in the neighborhood of two octaves.

The finer points with reference to the singing voice, such as the definite position of the lips, tongue, palate, etc., in the production of the different notes, together with the action of the expiratory muscles and the management of the breath, are not entered upon here, for the reason that they belong more particularly to the technical works on voice culture.

Ganglionic Cells which Preside over the Motor Innervation of the Larynx.—The ganglia which preside over the motor innervation of

the larynx are situated, as we know, in the floor of the fourth ventricle. These ganglia, moreover, preside over all the movements which take place in the larynx, both voluntary and involuntary. A number of investigators go further than this, and claim to have demonstrated by physiological experiment the existence of a centre of laryngeal innervation in the cortex of the hemispheres. These experiments cannot as yet be regarded as conclusive. I am disposed to think that an element of confusion may have entered into the consideration of this subject, in that, whereas the centre of speech has been definitely located in the cerebral cortex, it seemed plausible that a motor centre might also be traced to this region.

CHAPTER LXXV.

LARYNGOSCOPY.

The optical principles involved in laryngoscopy and its various appliances have already been described in a previous chapter.

In making an examination of the larynx, the same general principles apply here as in rhinoscopy, both in the management of the light and the use of reflectors, as also in the position of the patient. The only difference between the laryngeal mirror and the rhinoscopic mirror is in its size and the angle at which the mirror is joined to the shaft. For laryngeal examination it is well to make use of the No. 4 or No. 5 mirror, and one in which the shaft is fixed to the reflecting disc at an angle of from 120° to 125°. The mirror is first warmed over the light to prevent the breath from condensing upon it and obscuring the image. Before its introduction it should be touched to the cheek or the hand to see that it is not too hot. The tongue of the patient should be protruded and seized between the thumb and forefinger of the left hand, a napkin being interposed, and drawn gently forward and down over the lower lip. If preferred, this may be done by the patient himself, who should make use of the right hand. The shaft of the mirror should be held easily and gently in the hand, as one holds a pen. With its reflecting surface downward and parallel with the dorsum of the tongue, and the shaft held away from the median line in such a position that it will strike the angle of the mouth, the mirror is passed backward until its edge touches the soft palate. It is then slightly inclined and passed downward and backward, until the uvula rests on its posterior surface, when without changing its inclination it is carried backward and upward by a quick movement, lifting the uvula and soft palate with it, until it rests firmly against the wall of the pharynx. When in position it should rest transversely in the fauces, and be inclined at an angle of 45°. The patient should now be directed to sound a high-pitched "A" or "ah," as by this note the base of the tongue is depressed, the epiglottis lifted, and the larnygeal cavity brought well into view. In pressing the mirror against the pharynx, it is well to press with a firm hand, as there is less danger of causing retching in this manner than if the mirror is

held free from the pharyngeal wall and unsteadily. The lower edge of the mirror should rest on the wall of the pharynx at a point above the free edge of the palate; in other words, in the lower portion of the naso-pharynx, as this part is less sensitive than the oro-pharynx, and therefore retching is less liable to occur. By reference to Fig. 127, the relative position of the parts and the position in which the

FIG. 126.—Method of Making a Laryngoscopic Examination.

mirror should be held will be easily understood, as well as the course of the illuminating and visual rays. Commencing at the light, the rays fall successively upon the reflecting mirror of the laryngoscope, from whence they are converged on the laryngeal mirror in the fauces, from which they are reflected upon and illuminate the laryngeal cavity. Returning now as visual rays, they travel back from the larynx to the laryngeal mirror, and are then deflected to the eye. This diagram also illustrates the importance of making use of the small

central aperture in the reflecting mirror for making the examination, as in this manner the illuminating and visual rays fall in the same line; for instance, while the illuminating rays pass through the dotted lines shown, and illuminate that portion of the laryngeal cavity upon which they directly impinge, were the eye placed beyond the edge of the reflecting mirror, the visual rays are liable to be reflected by the throat mirror on a portion of the larynx not fully illuminated. The habit so often practised, therefore, of placing the head mirror on the forehead and looking beneath it is one to be avoided.

The epiglottis is occasionally found so far overhanging the laryngeal cavity as to seriously interfere with the examination. To over-

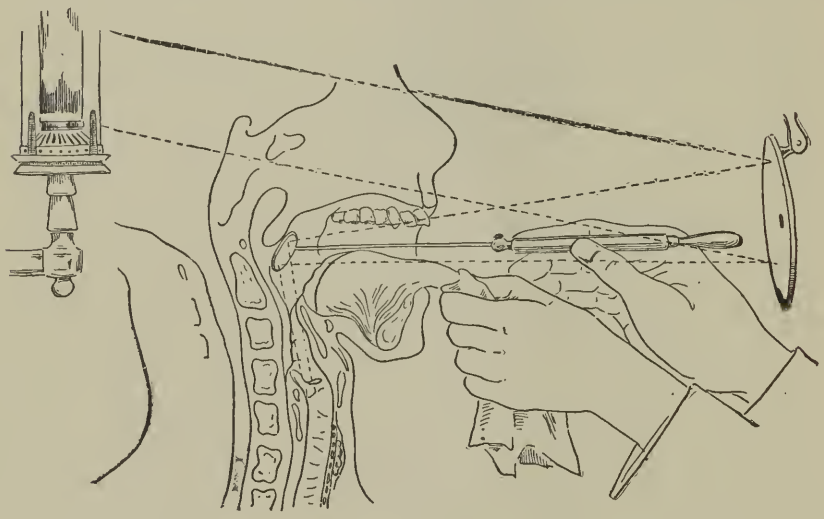

Fig. 127.—Diagram showing the Principle of Laryngoscopy.

come this difficulty various forms of hooks and pincettes have been devised. I have rarely met with a case in which these instruments were tolerated; on the other hand, I have rarely met with a case in which this difficulty was not overcome and a satisfactory view of the parts obtained by the exercise of a little patience. As a rule, an overhanging epiglottis is the result of muscular contraction, and disappears as the patient becomes accustomed to the manipulation. The enunciation of a high note aids somewhat in lifting the epiglottis and overcoming the difficulty. The throwing of the head of the patient well backward also tends to open the laryngeal cavity. Irritability of the throat is probably the most obstinate and trying of all the difficulties encountered in making a laryngoscopic examination. We occasionally meet with patients in whom the mere opening of the mouth

causes retching. In these cases nothing, perhaps, avails better than the application to the pharynx of a ten or twenty per cent solution of cocaine, though this should not be resorted to unless necessary, for the reason that the application of cocaine always results in temporary inconvenience and discomfort to the patient. Much aid is often gained by simply directing a patient with an irritable throat to take short, quick respirations, the cool air striking the fauces seeming to cause a certain amount of local anæsthesia. Occasionally in young children I have often persisted in the examination in spite of retching, the momentary opening of the larynx which accompanies the act of retching giving a fairly satisfactory, although but brief, inspection of the cavity. The best success in the laryngoscopic examination of a patient with an irritable throat is obtained by the exercise of patience and by a certain deftness and delicacy of manipulation, which is acquired with practice. Retching is merely the involuntary effort at deglutition excited by the presence of a foreign body in the food tract, the laryngeal mirror in this case being the foreign body; the rule, therefore, already suggested, should be kept in mind, viz., that of pressing the palate well up, in order that the mirror may rest upon the walls of the naso-pharynx rather than of the oro-pharynx, as in this position retching is less liable to occur. A thick or unruly tongue may at times interfere with the observation, by obtruding itself or arching itself up in the line of vision. In such cases recourse must necessarily be had to the use of the tongue depressor, the examination being made without protruding the tongue. This is an excellent method for examining the larynx and one which may well be resorted to much more frequently than it is. If the fauces are narrowed by large tonsils, this simply requires the use of a smaller mirror. An elongated uvula need not interfere with an examination, other than in rendering the fauces irritable. In such a case this organ can be easily caught on the back of the mirror and lifted out of the way.

It is well to say that in making an examination the mirror should not be held in place more than from five to ten seconds, especially with patients not trained to tolerance of it, as a much more satisfactory examination will be accomplished by avoiding the wearying of the patient and the danger of exciting retching by too long an examination. After the mirror has been placed in position, it should be held firmly against the pharynx and not moved about in search of the proper position and inclination for a view of the larnygeal cavity, as in this manner retching will be immediately excited. If it is desired to change the angle of inclination in order to bring into view the anterior or posterior portions of the larynx, this is easily accomplished

by simply turning the handle of the mirror between the fingers, thus changing the inclination of the reflecting disc without moving its position.

The Laryngeal Image (see Figs. 128 and 129).—The reversal of the image in the mirror is simply the same that takes place when one looks in an ordinary dressing-mirror, and in making a laryngoscopic examination it is no more necessary to bear in mind that the image is reversed than it is when making one's toilet before a dressing-glass. Anatomy teaches the general relation of the individual parts of the larynx to each other, and hence it is well for those commencing the practice of laryngoscopy to make themselves thoroughly familiar with the regional anatomy of the parts.

Having placed the mirror in the proper position in the fauces for

FIG. 128.—The Laryngoscopic Image during Respiration.

FIG. 129.—The Laryngoscopic Image during Phonation.

an examination of the living subject, the first object that will be noticed is the epiglottis, standing up prominently in the upper portion of the mirror. It is of a pinkish-yellow color, the cartilage showing through the mucous membrane at its crest and borders. The upper border is of a somewhat crescentic shape, more or less curved upon itself, and presenting great variations in contour in different individuals, as has already been noticed. It may be seen in different positions, varying from a fully erect one, in which the laryngeal cavity is completely exposed to view, to one in which it overhangs and largely conceals the cavity. If the anterior or lingual surface of the epiglottis is brought into view, there will be noticed three folds of mucous membrane passing from the epiglottis to the base of the tongue, one in the median line, the glosso-epiglottic ligament, dividing the depression between the epiglottis and the base of the tongue into two

fossæ, the lingual or glosso-epiglottic fossæ. On the outer side of these fossæ are seen slight folds of mucous membrane, which are sometimes designated as the lateral glosso-epiglottic ligaments, although they contain no ligamentous tissue. These fossæ occasionally afford lodgement for particles of food and other substances, and should always be inspected in searching for foreign bodies in the throat. The posterior or laryngeal face of the epiglottis, just below the cavity of the larynx, is marked at about its centre by a rounded, pad-like prominence, of a deep red color. This is formed by the petiolus of the epiglottis, and is usually designated as the cushion of the epiglottis.

There will next be noticed two folds of membrane, passing downward and backward, one from each side of the epiglottis to the arytenoid cartilages, two small, rounded, knob-like prominences in the lower part of the image, which in the living subject are seen moving from a state of close proximity to one of wide separation in the acts of respiration and phonation. These folds of membrane are the aryteno-epiglottic folds, or, as they are usually termed, the ary-epiglottic folds. They form the lateral walls of the laryngeal cavity, separating it on either side from the pyriform sinuses. In the posterior portion of the middle third of each fold will be noticed a small, knob-like projection, which is formed by the cartilage of Wrisberg, and farther down a second rounded projection formed by the cartilage of Santorini, which, however, surmounting the arytenoid cartilage, simply serves to render it slightly more prominent, but, as a rule, cannot be distinguished from it.

Passing from one arytenoid cartilage to the other, and showing a slight depression or notch between them, especially noticeable when the cartilages are in approximation, will be seen a fold of membrane, the arytenoid commissure, which completes the circuit of the lumen of the larynx as follows: The epiglottis in front, the ary-epiglottic folds showing the cartilages of Wrisberg and Santorini forming the lateral wall, and the arytenoid cartilages and commissure posteriorly. Immediately behind this commissure will be noticed a closed fissure, between it and the wall of the pharynx, which is the orifice of the œsophagus.

Going back now to the ary-epiglottic folds, there will be noticed on the outer side of each a somewhat pyramidal-shaped cavity, the pyriform sinuses. These sinuses are bounded by the inner wall of the thyroid cartilages externally, the outer face of the ary-epiglottic folds internally, and the posterior wall of the pharynx posteriorly, where they approximate one to the other and pass down into the œsophagus behind the arytenoids. At the bottom of each sinus may

be seen or felt a projection formed by the superior cornu of the hyoid bone. These cavities afford a favorite site for the lodgement of fish-bones, particles of food, or other substances, and should be carefully searched in looking for foreign bodies.

Passing again to the interior of the larynx, the first object noticed below the ary-epiglottic folds are the two ventricular bands, or, as they are sometimes improperly called, the false cords. These are two folds of mucous membrane, one on either side, which pass from the receding angle of the thyroid cartilage anteriorly, where they are nearly in apposition, to the arytenoid cartilages posteriorly. They are somewhat rounded, prominent folds of mucous membrane, supported by the thyro-arytenoid ligaments, and presenting a deeper red color than the other portions of the laryngeal cavity. They move with the arytenoids, and are parallel with the vocal cords. Immediately below the border of the ventricular bands is seen a dark line, which separates them from the true vocal cords below. This line or fissure marks the entrance of the ventricles of the larynx. Immediately below the ventricles we come upon the true vocal cords, two white, glistening bands, moving back and forth with the acts of phonation and respiration. Their color is due to the fibrous tissue of which they are composed showing through the mucous membrane which covers them, this latter being extremely thin and supplied very sparsely with blood-vessels. The space of opening between the vocal cords forms the rima glottidis. When in apposition the rima is merely a straight line extending from the receding angle of the thyroid cartilages to the arytenoid commissure. When the cords recede from one another and are relaxed, a little, knob-like projection is seen immediately in front of the arytenoid cartilage, and about one-fifth to one-fourth of the distance between it and the receding angle of the thyroid. This is formed by the cartilaginous prolongation of the anterior angle of the base of the arytenoid, viz., the vocal process. During the act of phonation the cords are brought into close approximation, and in this manner any inspection of the parts below is prevented. During the act of inspiration, however, the cords are widely separated, and, if the mirror is properly adjusted and the illuminating ray sufficiently powerful, the subglottic portion of the larynx and the rings of the trachea may be brought under inspection, and in favorable cases the bifurcation of the trachea may be observed with the opening into the right bronchus. The position of the mirror in the fauces being, as a rule, posterior to the axis of the trachea, its anterior wall is brought into view, with its rings, surmounted by the cricoid cartilage. If it is desired to inspect the posterior wall of the trachea, this is accomplished only by bringing the laryngeal mirror

slightly forward in the fauces. Even a moderately overhanging epiglottis will ordinarily interfere with the success of this manipulation. When such an inspection becomes important two mirrors may be used.

In general, it may be said that the lining membrane of the larynx is of light rose-pink color, with a tendency to a yellowish tinge, especially when the cartilages are seen through on the surface, as at the crest of the epiglottis, on its sides, at the prominences made by the cartilages of Wrisberg and Santorini, and on the anterior wall of the trachea where the rings are manifest. At all these points the membrane is of a light pinkish-yellow color. Again, where the membrane covers a mass of glands, lymphatics, or loose connective tissue, it is of a deeper red color. This is noticeable on the cushion of the epiglottis, the epiglottic folds, the arytenoid commissure, and the ventricular bands.

In making a laryngoscopic examination, the first thing to observe is the general appearance of the mucous membrane, to determine whether it is discolored in any way, or whether it shows evidences of any of the forms of inflammatory action. The general contour of the laryngeal cavity should then be inspected, to ascertain the existence of neoplasms, or whether there may be loss of tissue from ulceration or any destructive process; and, finally, the movements of the cords, both in phonation and respiration, should be examined, to determine whether they are perfectly approximated in the median line, and the readiness with which they are abducted in inspiration, and, furthermore, whether their movements on both sides are perfectly symmetrical. In determining this latter point, it should always be borne in mind that the epiglottis is not infrequently deflected to one side or the other. Ordinarily, in making a laryngoscopic examination we bring the centre of the epiglottis into alignment with the arytenoid commissure. If, however, the epiglottis is deflected to one side, an alignment of this kind will so far distort the image of the part below as to give, not infrequently, the impression of marked deficiency of movement, or even paralysis, of one side of the larynx. Hence one should acquire the habit of inspecting the lower portion of the laryngeal cavity without reference to the epiglottis.

CHAPTER LXXVI.

ACUTE LARYNGITIS.

In former times this term was used to designate an acute inflammatory affection involving the mucous membrane of the larynx, marked by the occurrence of extensive swelling, usually of an œdematous nature, with notable interference with respiration; while to the mild form of inflammation of the mucous membrane lining the larynx the term subacute laryngitis was given. The term subacute is objectionable; and I think it is better to designate as an acute laryngitis that variety of the disease which was formerly described as subacute; that form which is accompanied by extensive swelling of the parts we will consider in the chapter on phlegmonous laryngitis.

The affection is not a serious one, the inflammatory process confining itself mainly to the mucosa proper, without involving the deeper tissues. Its principal interest lies in the fact that the voice is notably impaired and perhaps lost.

Etiology.—We are generally taught that a sore throat or an acute laryngitis is the result of an exposure to cold, and this undoubtedly is the immediate exciting cause of the attack in the large majority of instances; but, underlying this, I think almost invariably we shall find that there exists a mild chronic inflammation of the mucous membrane of the larynx, which, under the influence of an exposure, takes on an acute exacerbation. Furthermore, I am disposed to think that an inflammatory process in the larynx is very rarely, if ever, a primary affection, but is secondary to an inflammatory process involving some portion of the air tract above. This is either an obstructive lesion of the nasal cavity proper, or some morbid process in the nasopharynx.

Recurrent attacks of hoarseness, with loss of voice, should always call attention to the probable existence of some diseased condition above the vocal organs.

It occurs at all ages. Before puberty, as a rule, we find it secondary to hypertrophy of the pharyngeal tonsil. During the second and third decades of life it is more liable to occur in connection with some form of rhinitis, while in later years it is dependent upon, in

most instances, a chronic naso-pharyngeal catarrh. Among the rarer causes of the disease are the inhalation of irritating vapors, such as chlorine, iodine, ammonia, sulphur, etc., or the breathing of a smoke-laden atmosphere, from tobacco, wood, or coal. Overtaxing the voice in public speaking, singing, or shouting may also bring on an attack.

Men are more liable to attacks than women, simply because they are more exposed to colds and more frequently suffer from chronic catarrhal troubles.

The occurrence of an acute laryngitis at the onset or during the course of an attack of measles, scarlet fever, diphtheria, typhus and typhoid fevers, is usually unimportant. The graver complications in the larynx which occur in connection with the exanthemata are due to a perichondritis or chondritis, and not to a catarrhal inflammation of the mucous lining.

Mention should be made in this connection of the acute laryngitis which occasionally follows the administration of drugs, iodide of potassium being especially active in this direction. The laryngeal hyperæmia from such causes is almost invariably accompanied by a similar process in the nasal mucous membrane.

Pathology.—The changes which occur in the membrane consist primarily in a dilatation of the blood-vessels, with an arrest of secretion in the muciparous glands. This is soon followed by the second stage, which consists in the pouring out of a moderate amount of serum from the blood-vessels, together with increased secretion of mucus from the glandular structures. The inflammatory process usually is most active in those parts of the larynx where the mucous membrane is loosely attached to the parts beneath, as in the ary-epiglottic folds, the arytenoid commissure, and the ventricular bands. The mucous membrane of the cords consists practically of epithelial cells and a minute network of blood-vessels. At this portion of the larynx we have, therefore, merely dilated blood-vessels, without increased secretion. The laryngeal mucous membrane below the glottis is rarely involved to any extent; when this, however, occurs, it becomes the seat of considerable swelling and injection. The mucous membrane of the epiglottis rarely presents any marked evidence of inflammatory action.

Symptomatology.—The prominent and most notable symptom in connection with an attack of this affection lies in the impairment of the voice, which may be hoarse or completely lost. Complete loss of voice in an attack, however, is almost invariably the result of extensive swelling of the arytenoid commissure, or possibly of the subglottic membrane, thereby interfering with the approximation of the

cords. It is exceedingly rare to meet with a case of acute laryngitis, even of an aggravated form, in which a vocal tone cannot be produced, provided sufficient effort be made. A patient is usually disposed to use the whispering voice, even when phonation is possible. This is undoubtedly due, in part, to the fact that phonation requires a labored effort.

Cough is occasionally present but is rarely troublesome, and when present is due to a complicating tracheitis. If the subglottic portion of the larynx, however, is involved, the cough is liable to be troublesome and persistent. It is, however, exceedingly rare to meet with an acute subglottic laryngitis in an adult.

Pain is not ordinarily present, although there is usually a feeling of soreness about the region, with slight tenderness on external pressure or digital manipulation.

Painful or difficult deglutition is present only when the disease accompanies an acute pharyngitis or some acute affection of the parts above the vocal organs.

The disease is purely a local one, and ordinarily is attended with no marked systemic disturbance, although, if it accompanies or complicates an acute affection of the naso-pharynx or nasal chambers, it may be attended with loss of appetite, headache, and other evidences of mild febrile disturbance.

Diagnosis.—The recognition of the disease is easily made by the character of the voice, although the laryngoscope should always be made use of to determine the amount and extent of the inflammatory process.

An examination of the parts simply reveals the whole mucous membrane lining the larynx of a bright red color, the tint of the membrane being deeper in those parts which are loosely attached, such as the ary-epiglottic folds, ventricular bands, and the arytenoid commissure. The appearance of the vocal cords in this affection is often indicative of the extent of the inflammatory action, and hence these should always be inspected with especial care, their appearance frequently indicating the severity of the attack. In a mild case we may see simply the enlarged blood-vessels in the membrane thrown into strong relief by the white tissue of the cord beneath. If the attack is more severe the whole cord presents a pale pinkish tinge, while in still more aggravated cases we observe a deep red, beefy appearance in the membrane, not only of the cords but of other portions of the larynx.

If the subglottic portion of the larynx is involved, which, as before stated, is a rare event, this is recognized only when the cords are in a state of abduction, when the membrane below will be seen bulg-

ing out in a rounded mass, symmetrical on either side, of a deep red color, and notably encroaching on the lumen of the subglottic region.

The movements of the cords, as seen by examination, are normal in character, although their excursion is somewhat hampered by the swelling of the membrane, and while abduction is normal and complete, adduction is imperfectly accomplished, not so much as the result of impaired muscular action, as from the fact that the movements of the arytenoids are interfered with by the swelling of the mucous membrane of the commissure. The chink of the glottis, moreover, in phonation, assumes a somewhat wider elliptical shape, on account of the impairment of tension, as exerted by the thyro-arytenoid muscles.

The diagnosis need not necessarily depend entirely upon laryngoscopic examination, in that a careful analysis of the symptoms will usually clearly indicate the seat and extent of the inflammatory process. The loss or impairment of voice sufficiently points to the larynx as the seat of the disease, while the absence of cough, with expectoration, eliminates the question of a bronchitis. This, taken in connection with the absence of febrile disturbance, is usually sufficient to render the diagnosis clear.

Course and Prognosis.—The disease runs its course in from five to ten days, and usually undergoes spontaneous resolution. It involves no dangers to life. Its main importance is in the impairment of function which it entails.

Treatment.—If the attack comes on in connection with an acute inflammatory process involving some portion of the passages above, the primary indications for treatment consist in measures directed to these parts, sufficiently described in the earlier chapters, and frequently it will be found that the laryngeal disease disappears without further interference. While these measures in all cases have a marked effect on the morbid process in the larynx, and in many are sufficient without further treatment, the local applications to the laryngeal membrane itself undoubtedly aid very much in hastening a cure. I can understand objection to local measures only on the ground that the applications are made by means of the brush, sponge, or probang, and therefore the injurious effect is the result of the instruments used rather than of the local astringent. The larynx is easily reached by means of the ordinary atomizers, such as those shown in a preceding chapter; and in applying topical remedies to this organ, therefore, an atomizer should always be used. In this way we not only fail to irritate the parts, but it has been my unvarying experience that the use of astringents is attended with the best of

effects in this disease. The agents to be used are, in the order of preference, as follows:

Liquor ferri persulphas, ...	gtt. 5 to 10 to ʒ i.
Argenti nitras, ...	gr. 2 to 5 to ʒ i.
Zinci chloridum, ...	gr. 5 to 10 to ʒ i.

A better local effect, perhaps, is obtained by first spraying out the larynx with a mild solution of borax, soda, or any mild unirritating cleansing lotion. These applications may be repeated daily until entire relief is given. I question if steam inhalations are of very much value in acute laryngeal inflammations, in shortening the duration of the disease, although when compound tincture of benzoin, camphor, oil of tar, oil of eucalyptus, oil of turpentine, or the oleoresin of cubebs is added to the boiling water they undoubtedly give notable relief to subjective symptoms, especially at the onset of the attack, when the membrane is dry and the parts are stiff and painful.

I have never been convinced that counter-irritants, in the form of blisters, poultices, or hot fomentations, produce any notable effect in an acute laryngitis. Cold applications to the neck by means of an ordinary ice bag or cold wet cloths frequently changed will often serve to cut short an attack of acute laryngitis, if undertaken early enough and persisted in for a sufficient time to test their efficacy.

The value of throat lozenges in an acute affection of the larynx is very questionable and need not be further discussed.

General medication is not specially indicated in acute laryngitis, although early in the disease it is always well to administer a saline laxative, and put the patient on small doses of quinine for a few days, or, better still, to administer five or ten grains of salicin three times daily until the attack passes away. If there is much irritation of the larynx, and the cough becomes a symptom of any prominence, we are often compelled to administer some anodyne. Lactucarium often answers a good purpose in these cases; it is a harmless drug, and may be given quite freely. An excellent form for its administration is in the lozenges sold in the drug-stores under the name of Pâte Aubergier. Failing this, we may administer codeine in doses of from one-eighth to one-sixth of a grain, repeated every four hours.

We are often called upon by public singers or speakers, seeking relief from a hoarseness or a complete loss of voice, when it becomes a matter of some importance that the disability should be relieved at the shortest possible notice. I know of no definite method by which such a result can be unfailingly secured in any given time. The following measures, stated in the order of their importance, seem to give the best results: First, absolute and total rest of the voice, the

patient being directed to utter no tone above a whisper, and even the whispering voice to be avoided as much as possible. Second, confinement to the room, which should be kept at a fixed temperature of from 68° to 70° F., not above; while, at the same time, ample ventilation is secured without involving a draught of air. Third, charging the atmosphere with an abundance of moisture by means of steam generated from a spirit lamp, or some other equally unobjectionable method. Fourth, the application of cold to the surface by means of the ice bag. Fifth, the application to the larynx of a solution of nitrate of silver, five grains to the ounce, by means of an atomizer, to be repeated a second or third time during the day; the interval of the application and the strength of the solution being governed somewhat by the subjective symptoms resulting, and by the laryngoscopic appearances. Sixth, if the turbinated bodies are swollen, they should be reduced by an application of chromic acid. Seventh, if there is an acute inflammation of the membrane lining the vault of the pharynx, this should be thoroughly douched by the post-nasal syringe, and an application made of a solution of nitrate of silver, thirty grains to the ounce, while at the same time the patient should be placed under the influence of aconitine, one five-hundredth of a grain being given every hour until three doses have been given, and afterward every two hours until the constitutional effects are experienced, as evidenced by the prickling of the fauces, tingling of the lips, or reduction of the pulse. Eighth, the bowels should be kept open by a saline laxative; this is especially indicated if the naso-pharynx is involved.

CHAPTER LXXVII.

ACUTE LARYNGITIS IN CHILDREN.

In young children the glottis is not only much narrower than in adults, but the mucous membrane is more highly vascular and more loosely attached to the parts beneath. An acute laryngitis, therefore, at this period of life pursues a somewhat different course, and hence it seems wise to consider it under a separate heading. Moreover, there are two varieties, dependent on the portion of the larynx which is involved. In certain cases that portion only of the mucous membrane which is above the vocal cords is affected, and the attack runs a somewhat mild course; while in those in which the mucous membrane below the vocal cords is involved the symptoms are of a much more alarming character; the breathing space is much encroached upon, and certain systemic symptoms are manifested which add markedly to the gravity of the affection.

The majority of cases, probably, occur between the first and fourth years.

Acute Supraglottic Laryngitis.

This is a mild form of inflammation of the mucous membrane lining the larynx, which is practically identical with that which occurs in adults, so far as the etiology and symptoms are concerned. Its predisposing causes are mainly mild catarrhal conditions of the upper air tract, while the exciting cause is usually exposure to cold. In many instances it occurs in connection with an attack of acute rhinitis, although it may develop without any apparent complicating disturbance of the parts above. The onset of the attack may be marked by a slight febrile movement and loss of appetite, or it may come on without any apparent constitutional disturbance. The voice becomes hoarse, and in rare instances is completely lost. Well-developed cough is not usually present, although there is a sense of irritation in the larynx which gives rise to a slight hacking attempt at clearing the throat. Tenderness of the parts is a constant feature of the disease.

The inflammation here confines itself mainly to the mucous mem-

brane covering the ventricular bands, the posterior commissure, and the vocal cords. The swelling of the mucous membrane is but slight, and dyspnœa is rarely if ever present. Spasm of the glottis seldom occurs in this form of laryngeal inflammation.

Supraglottic laryngitis, therefore, is really of a rather trivial character. The diagnosis is based mainly on the absence of febrile disturbance, the coincident attack of acute rhinitis, and the character of the voice, which is hoarse rather than aphonic. The tenderness over the larynx is a symptom of diagnostic value.

If it is possible to secure a laryngoscopic examination, this, of course, will add much to the certainty of the diagnosis. This examination is much more easily made in young children than is generally supposed, and I think in all cases it should be attempted.

The disease runs its course in from one to two weeks, and involves no dangerous tendencies other than the possible supervention of the subglottic form of the disease, although it must be borne in mind always that a catarrhal laryngitis may occur in connection with measles and other of the exanthems. The primary stage of a croupous inflammation of the larynx is an acute catarrhal inflammation. The exudation, however, makes its appearance so rapidly and occurs in connection with such high febrile disturbance that any doubt in diagnosis is cleared up in a comparatively few hours, the croupous disease being rapidly progressive, while the simple catarrhal inflammation under consideration develops its most serious symptoms at the onset of the attack.

Although this form of acute laryngitis in children involves no grave tendencies, yet we must all recognize the fact that a mucous membrane in a state of acute inflammation affords a favorable nidus for the lodgement and absorption of the disease germ of diphtheria.

If the disease occurs in connection with an acute rhinitis, the measures directed to the nasal cavity become of the first importance. For this purpose the following may be used:

℞ Cocainæ muriat., ...	gr. ij. to iv.
Aquæ, ...	♏ xv.
M. fiat solutio et adde	
Glyceriti acidi tannici, ...	ʒ i.
Ol. petrolati, ...	ad ʒ i.

This should be applied by means of the nasal atomizer every two or three hours. The cocaine is used to diminish vascularity, while the tannin has the effect of checking secretion. The above may be used in watery solution, although I think a certain permanency of action is secured by the fluid vaselin. For the tannin in the above

prescription, any of the simple astringents may be used, probably with equally good effect.

The bowels should be kept mildly open by some preparation of rhubarb, or, better still, possibly, castor oil. External applications to the neck and chest of camphorated oil or amber oil will be found to be particularly efficacious. I doubt if inhalations of steam for this form of disease are of any permanent service, although it is wise to confine the child for a few days in the nursery kept at an equable temperature, while at the same time the atmosphere is well surcharged with moisture.

Acute Subglottic Laryngitis.

In this form of the affection, while the mucous membrane throughout the whole of the larynx is in a state of mild inflammation, that portion below the glottis is swollen and infiltrated to such an extent as to give rise to dyspnœic symptoms, often of an alarming character.

This is an affection which is oftentimes described in medical literature as false croup, spasmodic laryngitis, and laryngismus stridulus.

Etiology.—The exciting causes of this form of disease differ in no essential degree from those which give rise to an attack of the supraglottic form. Beyond this, however, there are certain predisposing causes which seem to be particularly active in the developing of an inflammatory process in the subglottic tissues of the larynx; for while to the milder or supraglottic form the term "croup" does not especially apply, in that there are no prominently croupy symptoms, to this form of the disease the term "croup" seems to be particularly appropriate, in that the hoarse, barking, stridulous cough, with dyspnœa, etc., which are so characteristic of an attack, are admirably described by this term; and when we use "croup" here, it is to be understood that we refer to the term as it is conventionally used, rather than as defining a morbid process which is attended by the development of a false membrane.

We are usually told that it occurs with equal frequency in strong, healthy children and in weakly children. This is only partially true, for, whereas its victims usually show no marked evidences of malnutrition, yet probably in a large proportion of instances we shall find that they are suffering from a tendency toward the involvement of lymphatic tissues, under the influence of which children develop enlarged tonsils, hypertrophy of the lymphatic tissue in the pharyngeal vault, etc.; and, while not constituting fully developed struma, it

is a condition which, if carried a step farther, would result in a strumous habit. The important influence of this lymphatic habit in the development of catarrhal affections of the upper air passages is a matter of frequent clinical observation.

While the lymphatic habit is the most frequent predisposing cause of subglottic laryngitis, it is altogether probable that it arises in conditions where this habit does not exist. Bad hygienic surroundings, insufficient nourishment, improper clothing, and general causes of this kind undoubtedly predispose to it. Prolonged crying may give rise to sufficient laryngeal irritation to induce the disease.

How frequently a simple catarrhal rhinitis or other affection of the upper air tract, aside from lymphatic enlargement, may act in producing a subglottic laryngitis it is not easy to say. Undoubtedly such may occur. On the other hand, we may have cases of the mild or supraglottic form of laryngitis occurring with lymphatic enlargements, in connection with marked evidences of the lymphatic habit, as shown by the enlarged faucial and pharyngeal tonsils. I am disposed to think, however, that in a large majority of cases a laryngitis which arises in connection with engorged lymphatics in the passages above will take on the subglottic form; while a laryngitis which arises in a child free from any evidences of lymphatic disease will assume the mild or supraglottic form.

It occurs more frequently in boys than in girls, and has been observed in children from one up to twelve years of age.

Pathology.—The morbid processes which occur in the laryngeal mucous membrane have already been clearly indicated. The notable activity, however, in this process is noticed in that portion of the larynx which is below the glottis, where any swelling of the part necessarily gives rise to a laryngeal stenosis beneath the glottis. It is difficult to account for this symptom by a simple acute catarrhal inflammation of the mucous membrane, unaccompanied by œdema. But œdema does not occur in this region. Hence, the view already advanced seems an exceedingly plausible one: that a prominent element of tumefaction lies in the engorgement of the lymphatics, which in child life are richly distributed in this region.

Symptomatology.—The attack may come on independently of any involvement of the parts above, but in most instances it occurs coincidently with an attack of nasal stenosis. The constitutional disturbance is more marked here than in the milder form of laryngitis; and although the febrile movement rarely exceeds 100° to 101° F., yet the systemic involvement is indicated by the marked general malaise. The appetite is impaired and the child is dull and listless, and shows a lack of interest in its toys and other amusements.

The first symptom which calls attention to the throat, of course, is the hoarseness. This in the early stage is shown, not by loss of voice, but rather by a certain shrillness or metallic ring to the voice. As the inflammatory process progresses, the voice becomes distinctly hoarse or completely aphonic.

A harsh, dry, barking cough sets in very early in the attack, and immediately assumes that peculiar tone which we all recognize as being croupy in character. That the source of the cough is in the subglottic tissues is clearly indicated by the fact that even when the child is completely aphonic, the cough will still have this same barking, metallic ring to it.

At the beginning of the attack the secretion from the mucous membrane is arrested, and the cough is dry and harsh. After the first or second day secretion sets in, and the cough is attended with a certain amount of expectoration, and is softer. As the subglottic obstruction makes its appearance the cough occurs in paroxysms, and is attended with a peculiar crowing inspiration.

From the very onset of the attack nocturnal exacerbations become a prominent and marked feature. These generally come on after the child has been asleep for a few hours, when it suddenly starts up, either with a paroxysm of croupy coughing, attended with a crowing, dyspnœic inspiration, or it wakens with a sudden and violent attack of dyspnœa. I am disposed to think that these symptoms are sufficiently accounted for by the inflammatory swelling, and that muscular spasm has probably little if anything to do with the condition.

It is a noticable fact that even after these symptoms have passed away, a certain amount of obstruction is observed in the child's breathing.

While the disease persists, a second or even a third attack may occur during the same night, although but one exacerbation is the rule. While the attack of laryngitis may last for one or even two weeks, these nocturnal exacerbations of dyspnœa rarely occur over three or four times. The first attack is usually the most serious in character, and on the second and third nights, and perhaps the fourth, they recur about the same hour, although with less severity, and finally cease.

Another characteristic of this form of laryngitis is that children who once suffer from an attack of this form of disease are very liable to have similar attacks with each exposure. Thus, during the damp cold seasons of the year a child may have a number of such attacks. During the intervals of the winter attacks, as a rule, the voice is apt to be thick and husky, and, moreover, the child shows evidence, usually, of some chronic catarrhal disease of the upper air passages.

Diagnosis.—A laryngoscopic examination, if obtainable, will always afford us the best information as regards the special affection with which we have to deal. This can and should be made, even in small children, much more frequently than is ordinarily attempted. If the larynx can be inspected, we find its whole mucous lining reddened and slightly swollen, while on inspiration there can be seen below the vocal cords, and intruding itself on the line of vision, the rounded masses of subglottic tissue, bellying out beyond the line of the true vocal cords, highly injected, and of a deeper red than the tissues above, with a tint verging on a purplish hue. They stand out in somewhat striking relief, with the vocal cords immediately above them, which are of a light pinkish color, or they may be almost normal. In many cases the portion of the larynx above the vocal cords may present but very slight evidences of inflammatory action.

In those cases in which a laryngoscopic examination cannot be made, the question of diagnosis becomes an exceedingly important one, as determined by subjective symptoms.

An attack of membranous croup is characterized by very much greater activity of systemic disturbance, together with a higher grade of febrile movement, as shown by the thermometer, than a catarrhal inflammation. Moreover, in croup the cough is not so persistent, and does not assume the same harsh, barking character. In fact, this latter disease comes on somewhat insidiously, the voice becoming completely lost early in the attack, and the dyspnœa, moreover, is progressive, and not characterized by nocturnal exacerbations. The ordinary speaking voice may be apparently lost in both croup and catarrhal laryngitis. Its character, however, is shown in the cough, which in croup is usually to an extent noiseless, while in the milder disease it is, as before shown, harsh and noisy. In those rare instances in which the croup membrane is located beneath the cords, and in which the voice is not completely destroyed, of course the differential diagnosis is rendered exceedingly difficult, and must be based on objective rather than subjective symptoms.

In diphtheria we have the marked prostration, general malaise, and other evidences of blood poisoning. A bacteriological examination of the secretions about the larynx will usually render aid in excluding diphtheria.

The general course of the disease will always be of marked assistance in establishing a diagnosis. The nocturnal exacerbations and diurnal amelioration of symptoms are characteristic of the simple catarrhal inflammation of the larynx, whereas the slower but usually progressive course of an exudative affection will ordinarily remove any obscurity of diagnosis quite early in the progress of the attack.

Enlarged cervical glands are the rule in all three forms of disease, and hence their presence is of but little diagnostic value.

A foreign body in the larynx of a child will not infrequently give rise to symptoms which cannot be distinguished from a laryngitis. In such a case the laryngoscope or digital exploration will alone reveal the true condition with which we have to deal at the onset of the attack, although the development of symptoms ought very soon to aid the diagnosis.

Prognosis.—The disease runs its course in from one to two weeks, and undergoes spontaneous resolution without involving very serious danger to life. The onset of the attack, as we have seen, is characterized by nocturnal exacerbations of a dyspnœic character, which at the time seem somewhat alarming; yet after the second or third recurrence they cease altogether, each attack being less severe than its predecessor. A few rare cases, however, have been reported in which death occurred.

Treatment.—We have here to deal with three conditions: *first*, a mild chronic inflammation of the subglottic mucous membrane—the result, in the majority of cases, of an engorgement of the lymphatics both here and in the parts above, such as the naso-pharynx, giving rise to a chronic catarrhal condition; *second*, an acute inflammation of the subglottic membrane, which we regard as a lighting up, as it were, of a chronic inflammation, under the influence of exposure to cold; and, *third*, the nocturnal exacerbation.

Treatment of the Chronic Condition.—Iodide of iron should be given in doses of twenty drops three times a day to a child ten years of age, and to a younger child in proportion, either alone or with cod-liver oil, and should be persisted in from three to six months. The general condition of the child, as well as the local enlargement of the lymphatic tissues in the throat and cervical region, should be watched with considerable care. If the faucial tonsils are enlarged they should be excised. If the lymphatic tissue in the vault of the pharynx is sufficiently large to cause nasal obstruction, or is the seat of excessive secretion, the mass should be removed in the manner previously described.

It is scarcely necessary to add that the child should be placed as far as possible in the best hygienic surroundings.

Treatment of the Acute Process.—As soon as evidences of the croupy attack develop, the child should be kept in the nursery, in a temperature of 70° or 72° F., and the room properly ventilated; at the same time the atmosphere should be kept thoroughly charged with moisture. The bowels should be moved by the administration of, preferably, a mercurial, in the form of calomel or hydrargyrum

cum creta, two to three grains of either to a child from five to ten years of age.

Medication to promote a freer secretion from the mucous membrane may be administered in the form of some of the salts of ammonia, preferably the muriate.

If the ammonia is not well tolerated, we may substitute the tincture of cubebs, in from three to five drop doses.

I do not regard the use of cough mixtures in this disease as a matter of great importance; if the stomach is in any way disturbed, they should not be exhibited. As a rule, opiates should be avoided. If the cough is distressing and persistent, it is liable to aggravate the local condition, and the general strength is impaired by loss of sleep; in such a case sedatives become necessary, and we may administer the following:

℞ Acidi hydrocyanici dil., ... ℥ ij.
Codeinæ, ... gr. iss.
Ammonii muriatis, ... gr. xvi.
Aq. laurocerasi, ... ad ℥ ij.
M. Sig. A teaspoonful every two hours as needed.

The above prescriptions are for a child of seven years; the ingredients may be given proportionately for younger children.

If the laryngeal affection is accompanied by a catarrhal condition of the nasal passages, local treatment to this region becomes of special importance. If the child is tractable, the passages should be sprayed out daily with one of the cleansing solutions already given, followed by the application of an astringent. If the child is too young to aid the manipulation, we may accomplish much in the direction of keeping the passages clear by the use of a weak solution of cocaine, suspended in an oily menstruum.

After the fourth or fifth day, when the nocturnal exacerbations have ceased, and the secretion in the inflamed part has set in, confinement in the nursery is no longer necessary, and if the weather is favorable there is no objection to a short walk in the open air, although the local applications should be kept up for some days, as well as the internal administration of one of the cough mixtures above given, but at longer intervals. During the course of the attack the diet should be carefully regulated.

Treatment of the Nocturnal Exacerbation.—The old practice recommends the administration of an emetic in an attack of false croup, the object being to facilitate the expulsion of the accumulated mucus in the larynx. This is an awkward practice, and it seems to me an exceedingly objectionable one, for it is of importance that the digestive apparatus should be maintained in a healthy condition, and the drugs

which are administered for the purpose of emesis are liable to produce more than a temporary effect on the mucous membrane of the stomach. We have taken the ground that there is no spasmodic muscular contraction in this disease; therefore this indication for the production of vomiting is not present. The act of vomiting undoubtedly relieves the larynx; this can be accomplished with less disturbance to the stomach by simply inserting the finger into the fauces, or, if necessary, as far as the larynx, and should be resorted to if immediate relief becomes urgent.

The first thing, however, on being called to see a child suffering from the dyspnœa of a subglottic laryngitis, is to place the patient in a warm bath, its whole body being thoroughly immersed in water at a temperature of about 100° F.; we thus not only get the action of the warmth on the skin, but also the benefit of the inhalation of the warm vapor. The stimulating action to the skin may be increased by dissolving a small amount of mustard in the bath; this should be done with great care, of course, when having to do with the tender skin we have in a child. After keeping the child in the bath from five to ten minutes, it should be taken out and wrapped in warm blankets and put to bed, after which the skin may be dried by the aid of a warm towel passed under the flannel.

These measures failing to relieve, we may give inhalations of hot steam, generated by slacking lime or by a spirit lamp. The efficiency of steam inhalations is aided, perhaps, if we add to the hot water a teaspoonful of fluid extract of lupulin, extract of pinus canadensis, oil of turpentine, oil of tar, tincture of benzoin, or a few drops of creasote.

Hot fomentations applied to the cervical region, over the larynx, either by means of a sponge or a towel wrung out with hot water, exercise a certain amount of derivative action.

If these measures fail to give relief, an attempt should be made to remove the secretions by means of the finger inserted into the larynx; or, if the operator possesses sufficient skill, there is no objection to gently passing a small sponge probang over the epiglottis and into the laryngeal cavity. This serves not only to dislodge the inspissated mucus, but may produce a movement of retching, by which the obstructing mucus may be expelled.

I know of no drug whose internal administration possesses any special virtue in the dyspnœic paroxysm of a subglottic laryngitis, unless we except the administration of ten or fifteen minims of ether, which may be given when other remedies fail. This may be followed by the inhalation of a small amount of the same. The action of this drug is probably as a stimulant and expectorant. A somewhat simi-

lar effect may be obtained from the use of nitrite of amyl. Excellent results have been obtained by the use of a solution of cocaine and menthol, applied by means of a spray.

All other measures failing to afford relief to the dyspnœa, resort should be had either to the insertion of an O'Dwyer tube or the performance of tracheotomy. If the case is an urgent one, and the proper instruments are not at hand for the above operations, a very simple measure and one which requires no special manipulative skill is the passage of an ordinary flexible catheter through the larnyx and into the trachea. As before shown, however, instances in which radical measures become necessary are exceedingly rare in subglottic laryngitis. Not infrequently, however, when first called to a case of this sort, it is by no means possible to be absolutely sure of one's diagnosis, and we are oftentimes compelled to treat symptoms as they arise rather than a recognized diseased condition.

CHAPTER LXXVIII.

CHRONIC LARYNGITIS.

Under this general term we describe three affections of the laryngeal mucous membrane, which, while they constitute distinct diseases from a clinical point of view, are grouped together because they are all essentially catarrhal processes. They are: *First*, chronic catarrhal laryngitis; *second*, chronic subglottic laryngitis; and *third*, trachoma of the larynx, or chorditis tuberosa.

Chronic Catarrhal Laryngitis.

By this term is meant a chronic catarrhal inflammation of the mucous membrane lining the laryngeal cavity. We adhere to the classification of disease which has been adopted throughout this work, and avoid the confusion which has crept into much of our literature on throat diseases.

The older writers describe three forms of chronic laryngitis—the syphilitic, tuberculous, and catarrhal—an error which is still followed by many who discuss syphilitic and tuberculous disease of the larynx under the general heading of "chronic laryngitis," and others who write of syphilitic and tuberculous laryngitis in connection with chronic catarrhal laryngitis. The essential morbid processes which constitute syphilis and tuberculosis are not inflammatory in character. Moreover, syphilis and tuberculosis are not to be regarded as the causes of a chronic catarrhal laryngitis. I think it a far better nomenclature to adopt the terms "syphilis of the larynx" and "tuberculosis of the larynx," and to restrict the use of the termination *itis* to the designation of an inflammation of a purely catarrhal character; and in using the term "chronic laryngitis," we therefore specify that form of disease of the laryngeal mucous membrane which is characterized by a chronic inflammation of a purely catarrhal nature.

This form of larnygeal disease has been greatly overestimated; many persons undoubtedly are affected with it and yet experience little discomfort. To singers and public speakers, however, it is a disease of no little gravity.

Etiology.—It is doubtful if a simple uncomplicated chronic laryngitis is ever a primary disease. Certainly no case has come under my own observation in which the development of the morbid process could not be traced directly to some diseased condition of the air passages above. It may result from a chronic naso-pharyngitis, hypertrophy of the lymphatic tissue in the vault of the pharynx, or from nasal stenosis as the result of hypertrophic rhinitis, deflection of the septum, the presence of tumors, or other obstructive lesion; it also may arise from an atrophic rhinitis.

If the lesion in the nose is obstructive, nasal respiration is interfered with and its important respiratory function to an extent affected; the current of inspired air reaches the larynx through the mouth; it is not warmed and cleansed as it should be in its passage through the nose, and hence leads to the development of a mild chronic inflammatory process in the laryngeal membrane. It is easy to understand how, in a similar way, the presence of hypertrophied pharyngeal or faucial tonsils may interfere with normal respiration and lead to a catarrhal disturbance in the larynx. While a chronic naso-pharyngitis does not necessarily give rise to any obstruction to the respiratory current, yet as a matter of clinical observation it is one of the most frequent causes of a chronic laryngitis. Why this should be so is not entirely clear; it certainly is not due to the secretions from the pharyngeal vault making their way into the larynx. It is probably the result of the constant hawking and vigorous efforts at clearing the throat which the lodgement of the thick and inspissated mucus in the fauces entails.

Between the ages of five and fifteen, the prevailing type of catarrhal disease is dependent upon some involvement of the lymphatic tissues; hence, at this period of life, a chronic laryngitis is in most instances the result of hypertrophy of the pharyngeal tonsil. Between the ages of fifteen and forty we find catarrhal diseases dependent upon some obstructive lesion in the nasal passages; hence, at this period, a chronic laryngeal disorder in the majority of instances is the result of a hypertrophic rhinitis or a deflected septum, or both. After the age of forty, the most common form of catarrhal disease is the result of some diseased condition of the naso-pharynx; at this period of life, then, the source of a laryngeal disorder is to be sought in a chronic naso-pharyngeal catarrh, for it is to be borne in mind that if a hypertrophic rhinitis, the result of a deflected septum, has previously existed, the membrane in later life undergoes a shrinking and to a certain extent ceases to be a source of disturbance.

While decidedly of the opinion that in the very large majority of instances the cause of the disease is to be sought in the passages

above, I am not ready to assert that this is the invariable rule, in that it would scarcely be justifiable to state that local causes may not exert a directly active influence in developing the disease; thus in public speakers, prolonged or excessive or perhaps too vigorous use of the voice may undoubtedly lead to a vascular turgescence which may induce a chronic inflammatory process. In the same way a singer, by too prolonged or too vigorous practice, or by the use of improper or incorrect methods of tone formation, may set up morbid changes in the membrane.

We are told that those occupations which involve the inhalation of a vitiated or dust-laden atmosphere, such as that of millers, carpenters, coal heavers, stone cutters, workers in tobacco, mill operatives, etc., have a marked influence in producing a laryngeal inflammation; this may be true, but it seems to me the statement is somewhat overdrawn. The mucous membrane in the upper air tract is very tolerant, and nature has provided an admirable method for cleansing the respired air in such a way that but little of its impurities reach the larynx. The prolonged use of the voice in public speaking or singing is liable to involve a certain amount of mouth breathing. One who is well trained always closes the mouth during inspiration, or recovery as it is called. While, therefore, the vitiated atmosphere may have something to do with the vocal impairment above alluded to, in most instances, probably, the improper methods of recovery are mainly at fault.

The moderate use of alcohol, probably, has but little influence on the larynx, while its excessive use is usually attended by a diffuse general inflammation, through both the naso-pharynx and the oro-pharynx, this condition setting up eventually a chronic laryngeal catarrh. The influence of tobacco is generally dependent upon the individual temperament. Most smokers indulge in the habit with impunity; in certain individuals, however, any slight excess is almost invariably followed by an attack of acute pharyngitis or naso-pharyngitis, and a resultant laryngeal hyperæmia.

Ingals has reported a series of cases of the disease which were dependent upon the rheumatic habit.

All catarrhal diseases of the upper air tract are more common in males than females, and the same law applies to the larynx. It occurs at all ages, although it is most frequently met with in adult life and middle age.

Pathology.—The morbid changes which occur in the mucous lining of the larynx, in an ordinary case of catarrhal inflammation, present no points of special interest. The changes in the vocal cords themselves consist mainly in increased vascularity, hyperplastic

changes being exceedingly rare in the mucous membrane of the cords. Rheiner describes a distinct form of chronic laryngitis under the name of "pachydermia laryngis," in which the hyperplastic changes are confined mainly to the posterior portion of the vocal cord, at its junction with the vocal process. These changes consist in an augmentation both of the epithelial and connective-tissue elements of the membrane, the epithelium being superimposed upon and distinct from the papillary layer beneath, in contradistinction to malignant disease, in which the epithelium burrows into and forms nests in the mucosa proper.

In certain rare instances, dilated and tortuous veins are observed coursing in the superficial layers of the mucous membrane covering the ventricular bands, the ary-epiglottic folds, or the face of the epiglottis. Mackenzie gives to this condition the name of "phlebectasis laryngea," regarding it as an independent affection resulting from strain or other cause. I am disposed, however, to agree with Duchek in regarding it as an adventitious feature of catarrhal inflammation.

Mackenzie, Gordon Holmes, and others describe a form of the disease under the name of "chronic glandular laryngitis," in which the inflammatory process confines itself mainly to the racemose glands, and which they regard as analogous to and in many cases a downward extension of a follicular pharyngitis or "clergyman's sore throat."

I do not recall ever having seen a case of inflammation of the mucous membrane of the upper air passages in which the morbid process confined itself to, or was specially active in, the muciparous glands, but I am disposed to think that, when the membrane presents the gross appearances of this, it is the lymphatic bodies that are the seat of morbid action, rather than the secreting glands.

Symptomatology.—The prominent feature, of course, of the disease consists in an impairment of function in phonation.

A notable indication of the weakness of function is shown by the fact that, in the morning, after the mucus which has accumulated in the air passages during the night has been removed, the voice is comparatively clear. As the result of the ordinary use which daily duties involve, the voice is liable to get weak and husky later in the day. In singers and public speakers, and in those whose occupation calls for the higher powers of the larynx, this impairment of vocal function is very noticeable. Both in singing and public speaking, a moderate use of the voice results in a tired, sore feeling in the larynx, which very soon compels the individual to abandon further effort. The feeling of weariness and distress which results is of course due

to the fact that the laryngeal muscles are brought into play under exceedingly unfavorable circumstances. They are not only hampered by the inflammatory process in the mucous membrane covering them, but the muscular effort required in effecting a proper tension of the cords is very markedly increased.

Diagnosis.—Ordinarily, the disease should be easily recognized by subjective symptoms. The impairment of voice establishes a diseased condition of the laryngeal membrane, while the absence of cough is a fairly clear indication that the parts below are not involved. A definite diagnosis, however, of course, can be established only by the laryngoscopic examination, as revealing the absence of tumors, paralysis, and ulcerative or exudative affections.

When seen by the laryngeal mirror, the mucous membrane lining the larynx will present the ordinary appearances of a chronic inflammatory process.

A simple, uncomplicated laryngitis, I believe, in all cases shows an evenly diffused and fairly symmetrical discoloration in both sides of the larynx. If this hyperæmia is confined to one side of the larynx, I should regard it as an exceedingly suspicious circumstance, and one which requires the most careful investigation with reference to the possible existence of a more serious affection, such as ulceration, a benign growth, or, more especially, malignant disease, unless a foreign body be present, or some other obvious cause.

The mucous membrane covering the cords, as we know, is composed of epithelial cells, superimposed directly upon the fibrous tissue of the vocal band, with the interposition of a somewhat scanty network of blood-vessels. Hence, in this region, the chronic inflammation is shown by a somewhat grayish discoloration of the parts, which stand out in contrast to the red, purplish color of the ventricular bands and other portions of the larynx, which are the seat of morbid changes. Moreover, the cords are slightly swollen, and present certain irregularities, not only on the surface, but on the edges, the result of a somewhat irregular epithelial proliferation. This is apt to be most marked in their posterior portion, and especially in the neighborhood of the vocal processes of the arytenoid cartilages; whereas the vascular hyperæmia gives ordinarily a grayish look to the cord.

Additional information is obtained by the movements of the glottis in phonation. Adduction of the cords is not accomplished with that perfection and precision which are observable in health. This is especially noticeable when the arytenoid commissure is swollen, and when there is marked epithelial hyperplasia at its anterior face, constituting an almost wart-like appearance in this neighborhood.

The epithelial hypertrophy on the anterior face of the arytenoid commissure forms minute, wart-like eminences, which project toward the anterior wall of the larynx in such a way that, when the glottis is closed, the membrane in this region looks as if it were traversed by small fissures. I think this is the condition which has led Stoerk to believe that fissures really occur in the membrane at this point, and to which he gives the name of "fissuræ mucosæ."

Prognosis.—The disease runs no definite course, and its symptoms persist as long as the morbid affections of the passages above, which are responsible for it, endure. While, therefore, it shows no tendencies to improve, there is, on the other hand, no marked disposition to grow worse. After the symptoms of vocal impairment have once developed, they persist usually in much the same degree, unless aggravated by special circumstances, such as improper use of or straining the voice. The principal changes which occur in the course of the disease consist in the repeated exacerbations of the inflammatory process, under the form of an acute laryngitis, due to exposure to cold or other causes.

The main point of interest, in the discussion of prognosis, has to do with the possibility of a simple catarrhal process in this region, developing into a more serious trouble, such as a benign or malignant tumor or tuberculosis. I believe that a catarrhal inflammation must be regarded as an active factor in the causation of a laryngeal neoplasm, for while the active hyperæmia which the laryngoscope reveals in the larynx, in a case of neoplasm, may be the result of the growth, the clinical history of the patient usually teaches us that a chronic laryngitis, in connection with a diseased condition of the air passages above, existed long before the development of the tumor.

As regards malignant disease in the larynx, I do not think that either our knowledge of pathological processes or the teachings of clinical investigation lend any support whatever to the view that a simple catarrhal process in the larynx is either an active or a predisposing cause of a cancerous growth.

As to tuberculosis, I regard the two diseases as entirely separate and distinct, and I know of no clinical observation which justifies us in regarding tuberculous disease as even a remote danger to a simple catarrhal process.

The only further element in prognosis which requires consideration is that of the curability of the catarrhal disease. Many writers assert that, even after the disappearance of the morbid condition under proper treatment, the voice is liable to remain weak and hoarse. This I should regard as sufficient evidence that the disease had not

been cured; and by a cure I mean, not only of the local morbid process, but of the more important conditions in the air passages above which have been active in its causation. In the present state of local and general therapeutics, I believe we are fully competent to remove diseased conditions not only of the larynx, but of the parts above; and when such has been accomplished the voice should be restored to its fullest functions.

Treatment.—It has already been asserted, with a certain degree of emphasis, that a chronic laryngitis is not a primary but a secondary disease, dependent upon some diseased condition of the parts above. The first and most prominent indication, therefore, for its treatment consists in the thorough restoration of the passages above to a condition of health. If an hypertrophic rhinitis exists, it should be treated after the manner already described in the chapter devoted to that subject. The same is to be said in regard to a deflected septum, chronic naso-pharyngeal catarrh, hypertrophied pharyngeal, faucial, and lingual tonsils, etc. If an atrophic rhinitis exists, this we know to be an incurable disease, and yet, as we have already shown in the chapter on that subject, it is one which can be brought practically under control so far to obviate to a very great extent the influence of the disease upon the parts below; hence, even when a laryngitis is dependent upon this condition, we may hope by active measures, both at the hands of the physician and the patient, to bring the resultant laryngeal disease under control.

The question of the value of local applications to the larynx, together with that of the various methods by which they are made, has always been a subject of considerable discussion. As before stated, the prominent indication in the treatment of the laryngeal disease lies in the treatment of the parts above; and yet very much is undoubtedly gained by the direct local treatment. This requires no very special skill of manipulation, and can be easily and effectively made in the hands of one not specially trained in laryngoscopic methods. A brush, sponge, probang, or instrument of this sort, I think, should never be applied directly to the laryngeal cavity in a simple catarrhal inflammation, except at the hands of a thoroughly well-trained manipulator. My preference is very decidedly in favor of some form of spray producer, either that worked by compressed air or some simple hand-ball instrument.

I believe that in the treatment of a simple catarrhal process, the milder astringents are far more efficient than the stronger ones. The indications for caustics or destructive agents in this disease do not exist. The morbid process is confined mainly to the superficial tissues, and hypertrophic conditions which require destructive measures

are exceedingly rare. Of all local astringents, I regard nitrate of silver as probably the best.

As a rule, I think a ten-grain solution is of sufficient strength to accomplish all that is necessary, although in some instances a twenty-grain solution may be used. Still, regarding this drug as most valuable in the majority of instances, a change is occasionally desirable, when we may substitute for silver other drugs of similar action. Thus, in the order of preference, we may use:

Argenti nitras,	gr.	5 to 20	to the oz.
Zinci sulphas,	"	5 " 20	"
" chloridum,	"	2 " 6	"
Liquor ferri persulphatis,	min.	10 " 30	"
Cupri sulphas,	gr.	3 " 10	"

I have never seen any special good accomplished in this disease by the vegetable astringents, such as tannic and gallic acid, and drugs of this order, or by iodine and its preparations, carbolic acid, creasote, etc.

Cold inhalations, by means of the globe inhalers, of astringent remedies, such as those above given, although much reduced in strength, are often attended with a certain amount of comfort and relief to the patient; and yet I think the value of this method is largely in those cases in which the catarrhal inflammation has extended somewhat into the bronchi, giving rise to cough and expectoration. The inhalation of nascent muriate of ammonia by the Lewin apparatus is of use mainly in those cases which are dependent on a naso-pharyngeal catarrh, the action of the ammonia being to stimulate the membrane, producing a freer secretion and thereby facilitating expectoration, with a consequent relief to the laryngeal disorder. The direct effect of ammonia on the laryngeal membrane is probably very slight. Inhalations of astringents by means of the steam atomizer are, I think, objectionable, in that the hot steam is liable to cause a certain amount of relaxation of the parts, while at the same time the astringent is so far diluted as to exert very little direct action on the laryngeal membrane.

We have already discussed the question of throat lozenges in a previous chapter.

It would seem, then, that our topical measures for the treatment of this disease are practically confined to certain astringent solutions applied directly to the larynx by means of the atomizer. Our therapeutic measures thus become exceedingly simple in character.

These direct applications to the larynx should be made somewhat according to circumstances. While condemning the use of caustics in the larynx, on the ground that destructive action is not desirable

in the majority of cases, yet we occasionally meet with instances of pachydermia in which we have a notable degree of hypertrophy at the posterior insertion of the cords and the anterior face of the commissure, giving rise to what appears almost like warty excrescences in this region. For this condition, a caustic application becomes necessary; the special agent used is perhaps of not so much importance as the nicety and dexterity with which it is applied, for it is desirable that the application should confine itself closely to the diseased tissue. My own preference is in favor of chromic acid, fused on the end of a probe, and applied with a properly hooded porte-caustique; although probably the solid stick of nitrate of silver, or acetic acid, might answer an equally good purpose.

There is one element of treatment which becomes of exceeding great importance in treating a chronic laryngitis in a singer or public speaker, and that is as perfect rest to the voice as is compatible with occupation and surroundings. An important element in the successful treatment of all cases of catarrhal disease is in the enforcement of certain hygienic rules in regard to the proper clothing of the body, the use of the bath, etc. These have already been fully discussed in the chapter on taking cold.

The habitual use of alcohol probably acts primarily on the digestive apparatus, and secondarily on the upper air tract. The moderate use of wines or alcoholic beverages is probably not directly injurious to the vocal organ; hence, I think it is not always demanded of us, or even wise, to forbid their use in all cases. The influence of the use of tobacco on chronic laryngeal catarrh is to be estimated in each individual case. Excessive use of tobacco is undoubtedly injurious; its moderate use probably has but little effect on the air tract.

Chronic Subglottic Laryngitis.

This fortunately somewhat rare form of chronic laryngitis is one in which the morbid process develops mainly in the subglottic portion of the larynx, resulting in certain hypertrophic changes whereby the breathing space is so far encroached upon as to result in the development, not infrequently, of symptoms of a grave character.

Etiology.—The origin of the disease seems to rest in considerable obscurity; it occurs more frequently in females than males, and is met with in the earlier periods of life, usually between the ages of fifteen and twenty-five.

The lymphatic habit we believe may be a very important active predisposing and perhaps direct cause of this form of laryngitis as met with in adult life. In the only cases of the affection which have

come under my own observation, the lymphatic habit, as evidenced by enlarged faucial or lingual tonsils, seemed to exercise a notable influence upon the development of the disease, as shown by the fact that the local condition of the larynx was markedly ameliorated by the removal of the hypertrophied lymphatic tissue in the parts above, and by the administration of full doses of the iodide of iron to correct the systemic condition. Typhus and typhoid fever may result in this form of laryngeal disorder, although they are more liable to give rise to a perichondritis; tuberculosis and perichondritis constitute morbid processes in which there is no relation either direct or indirect to lymphatic diseases; the same can be said of syphilis. As regards rhino-scleroma, it is probable that it may exert a causative influence in the development of subglottic laryngitis. That a simple idiopathic inflammatory process in this region, which is not influenced by any pronounced systemic condition, may give rise to a chronic subglottic laryngitis cannot be questioned, and yet I think in the large majority of instances we must look for some diathetic state, to explain the fact of a simple catarrhal process resulting in such marked hypertrophy as to seriously encroach on the breathing space.

Pathology.—Few post-mortem examinations have been made in cases of this affection, hence suggestions in regard to the true pathological changes which occur can only be speculative; and we content ourselves, therefore, with the views expressed above in discussing the etiology of the disease.

Symptomatology.—The onset of the disease is somewhat insidious, and is marked by a slowly developing, but progressive impairment of voice, which finally results in more or less complete aphonia. Cough, with expectoration, is ordinarily not present. As the swelling progresses, dyspnœa sets in, as evidenced both by inspiratory and expiratory stridor; the dyspnœa is not infrequently aggravated by exertion. At this stage of the disease, phonation is practically abolished, and the symptoms consist now in a slow but surely progressive increase of the difficulty in breathing. Repeated exacerbations of mild acute inflammation become a prominent symptom, under the influence of which the dyspnœa is temporarily increased; there is liable to be an increased amount of secretion, in consequence of which a harsh, metallic, ringing, or barking cough, which is apt to be persistent and oftentimes distressing to the patient, becomes a prominent symptom. The acute process subsides in a few days or a week, but the chronic process is progressive, until finally the encroachment on the air passages demands relief by tracheotomy, unless other and simpler measures have availed. Pain is occasionally

present, especially during the exacerbations, although this symptom is more characteristic of perichondritis than of subglottic laryngitis.

Diagnosis.—An inspection of the parts by the laryngoscope will show in the supraglottic portion of the larynx the ordinary appearances of chronic laryngeal catarrh or possibly no deviation from the normal standard, unless in the true cords, which ordinarily present a thick and somewhat rounded appearance, with a grayish, discolored aspect. Immediately below the edge of the cords there will be seen, bulging into the breathing-space, from either side, two rounded and symmetrically swollen masses of a grayish appearance, or in rare instances presenting the dark reddish color of a chronic inflammation (see Fig. 130). These tumefactions present an appearance of density and solidity, which give the condition the aspect of a neoplasm. The extent of hypertrophy necessarily affords a mechanical obstacle to the movements of the vocal cords in phonation and respiration. If the tumefaction is very marked, the anterior portions are in contact, presenting the appearance of an abnormal adhesion, or this coalescence may present posteriorly, or both conditions may exist.

Fig. 130.—Chronic Subglottic Laryngitis.

The tissues are apt to present a dry and somewhat glazed aspect. If the parts are seen during an exacerbation, the appearances are those ordinarily seen in acute inflammation, unless a certain amount of œdema supervenes, in which case we have the bluish-white, semi-transparent appearance characteristic of that process.

The clinical history of the disease is closely allied to that of perichondritis; in this latter disease, however, the tumefaction is not only irregular in outline, but asymmetrical, and invariably unilateral, whereas the disease in question is always bilateral and presents evenly rounded and entirely symmetrical tumefactions.

Prognosis.—In a few instances, in which the disease followed typhus fever, the symptoms developed very rapidly, and required tracheotomy at the end of from one to two months. In the majority of instances, however, as we have seen, the direct cause of the disease is not apparent. In such cases we have a slower and more insidious development, and the severe dyspnœic symptoms do not appear

until from nine to eighteen months after the first manifestations of the affection.

I know of no case in which spontaneous resolution has occurred. It would seem that in the majority of cases the disease is incurable, while in a certain proportion of cases active remedial measures have served permanently to eradicate it.

Treatment.—As will be easily gathered from what has been said, we have practically to deal with an organic stricture of the larynx, in which the point of narrowing is in the subglottic tissues.

In the majority of instances, either as the result of the failure of local measures to arrest the disease, or in consequence of its unimpeded development, tracheotomy becomes imperative.

No topical applications seem to be of any avail in promoting resolution of the thickened tissue.

Gerhardt scarified the tissues after the tracheal tube had been inserted, with apparently some favorable result, and yet not sufficient to permit of the permanent removal of the tube. Bergmann did a thyrotomy, and successfully destroyed the thickened tissue by the Paquelin cautery; while Sokolowski met with an equal success by excising the hypertrophied masses after opening the larynx.

Dilating bougies passed directly through the point of stenosis would, from late reports, appear to give favorable results.

In place, however, of using the solid bougie, a hollow dilator is used, as in this manner breathing is less interfered with, and the instrument may remain *in situ* for a longer time.

No case of this disease has come within my own observation in which dyspnœa became a distressing symptom. In those cases, however, which have been under my observation, evidences of the lymphatic habit were so prominent as to warrant the administration of iodine, which was given apparently with excellent results. The suggestion would therefore seem to be justifiable that the efficacy of some preparation of iodine should be thoroughly tried in these cases, especially if seen during early life or before grave dyspnœic symptoms have supervened. The iodide of iron should be administered rather than any other form of the drug.

Trachoma of the Larynx, or Chorditis Tuberosa.

This is an affection of the laryngeal mucous membrane which consists in the development on one or both of the vocal cords of a small rounded nodule or tuberosity. It is occasionally classified under the head of neoplasms. From a clinical point of view, however, it seems more appropriate to consider it as one of the forms of laryngitis, in

that the origin of the disease is invariably to be sought in a chronic inflammation of the laryngeal mucous membrane. On the vocal cord, usually midway between the vocal process and its anterior insertion is a small, rounded projection, which is sessile in character, and stands out from the free border of the cord, showing itself distinctly in profile on the laryngoscopic examination (see Fig. 131). It appears to be practically a tumefaction of the fibrous tissue of the cord, protruding from it, the same uniform color showing through the very thin mucous membrane. After it has developed it seems to remain stationary, and shows no tendency to increase in size. It may develop on a single cord, to be subsequently followed by a similar process on the opposite cord in exactly the same situation, or it may develop on both cords simultaneously. In my experience it occurs only as the result of an attempt to use the highest powers of the larynx when it is in a condition of chronic catarrhal inflammation, to exert an effort which can be accomplished with impunity only when the larynx is in a state of perfect health. In the lower and middle register of the singing voice, the notes are produced by vibrations of the vocal cords in their full length, the higher pitch being secured with each additional note by greater tension of the vocal cords. When we have reached the top or middle register the vocal cords seem to have reached their limit of tension; hence, still higher notes must be produced by shortening the vibrating cords. This is accomplished by gradually shortening the chink of the glottis by bringing into apposition the edges of the posterior portion of the cord until, finally, in the production of the upper notes of the head register the vibrations are confined to the anterior third of the vocal cords. How this was accomplished was always somewhat of a mystery until Madame Seiler showed the existence of a small, slender, rod-like fibroid cartilage embedded in the vocal cord and extending from the vocal process to the junction of the middle and anterior third of the cord. It is by means of this fibro-cartilage that the posterior portion of the cords are held in apposition, and the chink of the glottis in the high notes of the register is thus composed only of the anterior third of the two cords. It is at the posterior termination of this chink that these nodes or singer's nodes appear; hence, since we

Fig. 131.—Trachoma of Right Vocal Cord.

know that the very highest muscular powers of the larynx are required for the production of these high notes, I am disposed to think that these nodes are the result of this excessive effort in holding the posterior portions of the cords in apposition during the production of these high notes in a larynx which is the seat of an inflammatory process. As the vocal cord has no muciparous glands, the nodes cannot be due to hypertrophy of the gland structure. The pathological lesion is probably somewhat analogous to pachydermia, with the addition of a certain amount of connective-tissue hypertrophy. Wedel has also found a number of nuclei embedded in the tissues, and their existence would seem to indicate an inflammatory process.

The symptoms to which the condition gives rise are chiefly functional, and consist in hoarseness or aphonia, resulting from a mechanical interference with the free vibration and proper approximation of the cords. This hoarseness is especially noticeable in the singing voice, and the taking of high notes is rendered almost impossible.

The diagnosis is easily made by a laryngoscopic examination, the mirror revealing, on one or both cords, a small, whitish-gray nodule, always in the same location and especially prominent on attempted phonation.

The treatment consists mainly in topical applications to correct the chronic laryngitis which accompanies the affection. If the affection has lasted but a short time, or, in other words, the hyperplastic tissue is not organized, complete resolution may sometimes be secured by applying a strong solution of nitrate of silver three times a week at least, or better still, every day, using cotton wrapped on a bent applicator. The voice should not be used at all in singing, and as little as possible in conversation. If this measure fails to give relief, the larynx should be anæsthetized by a ten or twenty per cent solution of cocaine and the galvano-cautery applied by means of a fine-pointed electrode, just touching the point of the nodule while the cords are in a state of approximation. The current should be turned on and then almost immediately shut off again, to avoid risk of possible destruction of tissue. Too much importance cannot be attached to thoroughly eradicating the cause of the chronic catarrhal process. I do not think singers' nodes develop in a healthy larynx, and, furthermore, I do not think a catarrhal laryngitis exists except as the result of disease above; hence if the nodes are destroyed they are liable to return again unless the exciting cause has been thoroughly abolished.

CHAPTER LXXIX.

LARYNGITIS SICCA.

This is a name given to that form of catarrhal inflammation of the larynx which is characterized by a deficiency of secretion and the formation of crusts, which lodge upon and adhere to the laryngeal mucous membrane. This condition was first referred to by Rühle.

Etiology.—I do not find a case in which it did not accompany a diseased condition of some of the parts above; in a majority of cases it was in connection with an atrophic rhinitis; in others with an atrophic condition of the naso-pharynx or oro-pharynx. This would seem to indicate that the laryngeal affection is symptomatic, and yet when we consider the frequency of an atrophic process in the nasal passages, and the infrequency of a laryngitis sicca, we are led to the conclusion that there must be some diseased condition in the laryngeal mucous membrane.

Massei and others suggest that the atrophic process extends from the parts above to the larynx. We have already stated, with considerable emphasis, that catarrhal processes do not extend by continuity of tissue from the naso-pharynx into the larynx. I regard this as an almost invariable rule.

The direct cause of the disease in question, therefore, is probably in some morbid condition of the laryngeal mucous membrane, under the influence of which the function of the muciparous glands is either hampered or completely destroyed.

The symptoms are much aggravated by the inhalation of an abnormally dry atmosphere, as also occurs in cases of atrophic rhinitis when the turbinated bodies have been destroyed, and also by mouth-breathing.

Pathology.—The investigations of Luc, who has demonstrated in the crusts Loewenberg's ozæna diplococcus, would seem to show that the changes are similar to those which occur in atrophic rhinitis. This we regard, as previously stated, as an accompaniment rather than the cause of the morbid process.

That the condition is due to local changes, and is not entirely symptomatic of a diseased condition of the parts above, is shown by

the fact that the crust formation does not occur in the whole cavity of the larnyx, but only in the subglottic portion. The disease has been described as a "laryngo-tracheal ozæna," indicating involvement of the trachea. Crusts may be found extending below the cricoid ring, but are probably masses of inspissated mucus, whose source is the subglottic larynx.

Symptomatology.—During waking hours the normal movements of the glottis serve to keep the parts comparatively free from crust accumulation. During the night, however, they augment to such an extent that the symptoms on waking in the morning may be of a somewhat distressing character. They give rise to a more or less complete loss of voice with a feeling of irritation, and violent efforts to clear the throat. If the crust accumulation is large, dyspnœa may be present in a very marked degree. The voluntary efforts at clearing the part in the morning serve to give great relief at the time, although the cough, with the impairment of voice and sense of discomfort, generally persists more or less throughout the day.

Fig. 132.—Crust Lying in the Ventricle in Laryngitis Sicca.

The masses when expelled present much the same greenish-yellow appearance as those which are discharged in atrophic rhinitis, but are smaller.

Fetid breath is a constant symptom of the disease. The source of the fetor can as a rule be located, it being detected in the oral expiration, being thus distinguished from the fetor of atrophic rhinitis, which is more marked in the nasal expiration.

The mucous membrane beneath the crusts is usually somewhat eroded.

Diagnosis.—The subjective symptoms are so prominent as to indicate with a fair degree of accuracy the character and location of the diseased process. A certain diagnosis, however, can be made only by the use of the laryngoscope, which will reveal the greenish-gray crusts lodged upon and adhering to the subglottic portion of the mucous membrane and projecting into the lumen of the respiratory tract. In rare instances, thin flocculi of inspissated muco-pus or a dry crust may be seen above the vocal cords (see Fig. 132), and adherent to the ventricular bands or to the arytenoid commissure. In the large majority of instances, however, the disease confines itself to

the subglottic portion, and when it is seen above the cords the activity of the morbid process is much less.

If the crusts have been expelled by voluntary effort at the time of examination, the small, yellowish-gray flocculi will be seen here and there adherent to the mucous surfaces, while beneath them the subglottic membrane, if visible, will show evidences of an inflammatory process.

Course and Prognosis.—The disease is essentially chronic, and shows no tendency to improve except under treatment.

If we are correct in the view already taken, that the essential lesion consists in an atrophy of the glandular structures or the secreting apparatus of the mucous membrane, it would seem that, unless attacked comparatively early in its progress, the disease is somewhat intractable. And yet the atrophic process is not the only element to be considered. If we have the laryngeal disease occurring in connection with an atrophic rhinitis which is incurable, we can hope only to ameliorate the symptoms. If, however, we meet with it in connection with a curable affection of the nasal passages, the prognosis is favorable.

Treatment.—The first and most important indication for treatment is to establish a healthy condition in the mucous membrane of the upper air tract. If an obstruction exists in the nasal passages, either from a deflected septum, hypertrophic rhinitis, the existence of tumors, or from any other cause, this should be removed. If an atrophic rhinitis exists, our efforts should be directed toward establishing as healthy a condition of the nasal passages as our therapeutic resources are capable of, in the manner already discussed in the chapter devoted to that affection, although the disease itself is to be regarded as not amenable to radical cure. If a morbid condition of the naso-pharynx is present, this of course should also be subjected to proper medication.

The first indication for local treatment in the larynx consists in thorough removal of the accumulated crusts and inspissated mucus without undue irritation of the parts. The use of a brush or probang will usually accomplish all that is necessary. In mild cases the laryngeal atomizer answers an efficient purpose in softening the crusts, and thus enabling the patient to expel them by voluntary effort. The lotions to be used for this purpose may be the same as those already recommended.

After the parts are cleansed, local applications can be made, by means of the sponge or cotton pledget passed directly down upon the part, of one of the following in the order of preference:

Argenti nitras, ...	gr. x. to xx. to the oz.
Zinci sulphocarbolas, . . .	gr. xv. to the oz.
Zinci chloridum, ...	gr. x. to xv. to the oz.
Acidum tannicum, ...	gr. xx. to the oz.
Acidum lacticum, ...	ʒ ss. to the oz.
Tr. iodi comp., ...	ʒ i.-iij. to the oz.

The passing of a brush or probang through the glottis is not an especially difficult manipulation, and is ordinarily accomplished by a quick movement during the act of inspiration. The part to be medicated, as a rule, is simply that portion of the larynx which is below the glottis.

During the intervals of treatment it is well to direct the patient to make use, three or four times daily, if the symptoms are distressing, of an inhalation, by means of the steam atomizer or from an ordinary hand-ball atomizer, of one of the cleansing solutions already given. A solution of lactic acid, two or three drops to the ounce, used in an inhalator has been known to give good results. Creasote has been used internally with benefit, but usually internal medication is not indicated.

CHAPTER LXXX.

ACUTE PHLEGMONOUS LARYNGITIS, OR ŒDEMATOUS LARYNGITIS.

Œdematous laryngitis is used to designate that form of laryngeal inflammation which is characterized by unusual swelling of the parts as the result of serous infiltration. In the earlier literature we find the term "œdema of the glottis" in frequent use.

A great confusion in classification is found among the different writers; but it seems to me that those affections of the larynx which are attended with œdematous swelling may be divided into "phlegmonous laryngitis" and "symptomatic œdema," or simply œdema of the larynx, the latter term being used to designate those cases of œdema which are passive and non-inflammatory, while the terms phlegmonous laryngitis and acute submucous laryngitis are used to describe acute inflammation of the mucosa of the larynx occurring idiopathically or as a complicating lesion of an acute, active, deeply seated inflammation of neighboring structures, resulting in much tumefaction from serous infiltration.

Etiology.—The most active and practically the only cause which we can find for the affection is an exposure to cold. The local condition is an acute cellulitis. This occurs in other regions in the body, often from apparently slight causes; that it may occur in the same manner in the larynx, clinical experience teaches us.

In many instances, a mild acute laryngeal catarrh seems to act as a predisposing cause of the attack, although it may develop when the air passages are in a state of absolute health.

Excessive use of or straining the voice is regarded by some as an active cause of the disease.

It is more common among males than females, and is usually met with in early adult life, the majority of cases occurring between twenty and thirty; although instances have been observed as early as nine weeks and as late as eighty years of age.

That the disease is a comparatively rare one is shown by the investigations of Hoffman and Lestier.

The view that the disease is really in many instances true erysipelas

of the larynx, is undoubtedly correct, as the presence of Fehleisen's coccus has been detected in cases of phlegmonous laryngitis.

It may arise in the course of typhoid fever, of variola, of diphtheria, croup, typhus, or any of the exanthems. It is frequently traumatic in origin, either as the result of inhalation of acrid vapors or hot steam, and may also in rare instances develop indirectly as the result of swallowing corrosive poisons, or, again, it may occur in consequence of the impaction of a foreign body in the larynx, or in the passage of such an object into the œsophagus.

Pathology.—The morbid changes which occur are inflammatory in character, and at the onset are identical with those which characterize any ordinary acute inflammatory process involving mucous tissues. Its progress, however, is marked by an unusual activity both of vascular turgescence and especially of serous transudation, under the influence of which the membrane becomes enormously swollen and tense, especially in those situations where it is most loosely attached to the parts beneath, and where, therefore, there is the least mechanical obstacle to the serous distention. These are the ary-epiglottic folds, the ventricular bands, and the posterior surface of the epiglottis. Involvement of the vocal cords is somewhat infrequent, while extension to the subglottic portions of the larynx is a still rarer event.

The swelling diffuses itself somewhat uniformly and symmetrically through both sides of the larynx. As the disease progresses, the transudation changes to a sero-purulent and finally terminates in a purulent infiltration with abscess formation. When the process goes on to the formation of an abscess, this is usually unilateral, but it has been known to be bilateral.

Symptomatology.—The attack is ushered in by chilly sensations, or in rare instances by a well-marked chill followed by a mild febrile disturbance, the temperature ranging from 100° to 100.5° F. perhaps.

The rapidity of the development of the local process in the larynx is shown by the fact that dyspnœa follows almost immediately upon the onset of the febrile movement. The voice becomes impaired or completely lost, and the breathing stridulous, both with inspiration and expiration. The further development of symptoms is of those which characterize increasing dyspnœa. Respiration becomes labored, and the face florid and finally cyanotic. The extreme suffering of the patient is evidenced by his restless movements and anxious expression of countenance. These dyspnœic symptoms may develop in from twelve to twenty-four hours, or at the latest on the second or third day, when death ensues unless relief is afforded by tracheotomy or other remedial interference.

The above description applies to a typical well-developed case of the disease which has resulted from a severe exposure.

Diagnosis.—Our principal concern in meeting with a case of acute laryngeal dyspnœa is to determine whether we have to deal with an exudation, a phlegmon, a passive œdema, or the presence of a foreign body. The clinical history of the case will oftentimes aid us materially in determining this question, although our main dependence must lie in the examination of the parts by the laryngeal mirror. The membrane presents a bright red color, is tense, somewhat glassy, and semi-opaque. In the severer cases the ventricular bands and the posterior face of the epiglottis will present three large rounded masses prominent in the field of vision and practically obscuring the parts below, and presenting a more or less contracted triangular opening between them, through which respiration is carried on. There is evidence of active inflammation, but less tumefaction, in milder cases, while a unilateral phlegmon will be recognized by the same general appearance.

Fig. 133.—Acute Phlegmonous Laryngitis.

Prognosis. — The disease not only develops rapidly, but runs a somewhat brief course, usually terminating practically by the third or fourth day. In those severe cases in which the localized swelling so far interferes with respiration as to demand tracheotomy, the dyspnœic symptoms ensue usually in from twelve to thirty-six hours after the onset of the disease, the encroachment upon the breathing-space being due to a serous infiltration. In the milder cases, which run a somewhat longer course, the serous transudation is rapidly followed by discharge of the pus. The inference we draw from this is, that if a case of phlegmonous laryngitis at the end of thirty-six hours has not developed grave laryngeal stenosis, we may fully anticipate that it will run its regular course and undergo suppuration without the necessity of tracheotomy.

Suffocation constitutes the chief danger of the disease.

Treatment.—The first indication for treatment is to secure such local depletion as is possible by free scarification of the inflamed membrane. This can be accomplished by means of Tobold's concealed lancet or any other laryngeal knife that may be available (see Fig. 134). Failing these, resort may be had to an ordinary curved

bistoury, the blade being wrapped with thread up to within a quarter of an inch of its point. These scarifications should be made freely, not only along the face of the epiglottis, but on the swollen ventricular bands. The laryngeal mirror will assist or the finger may be passed in the fauces, provided the dyspnœa is not too great. These scarifications should be repeated twice or three times a day, to relieve the turgescent blood-vessels, and to allow the infiltrated serum to escape.

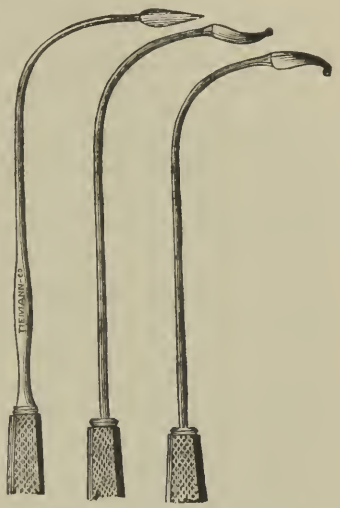

Fig. 134.—Laryngeal Knives.

Steam inhalations may possibly add to the comfort of the patient. Blisters are of no avail, although the application of leeches over the crico-thyroid membrane is to be recommended. Cold applications to the larynx, either in the form of ice bags or Leiter's coil, if efficiently and persistently maintained, are attended with excellent results. Pellets of ice may also be taken.

Internal medication is not especially indicated, other than the administration of an active saline cathartic.

Should these measures fail to arrest the dyspnœa, tracheotomy will have to be performed.

The cavity of the larynx is so far distorted that it is not probable that intubation would be successful. McEwen carried a case of phlegmonous laryngitis successfully through its graver dyspnœic stage by the insertion of an ordinary urethral catheter.

Of course, when the pus formation can be recognized and reached by the knife, the pus should be evacuated. Unless the physician possesses special skill in this direction, tracheotomy should be preferred.

CHAPTER LXXXI.

ŒDEMA OF THE LARYNX.

The term "œdema of the larynx" should, I think, be restricted to that morbid condition of the larnygeal cavity which is characterized by a somewhat extensive serous infiltration of the soft parts, and in which the œdema is the prominent and practically the only local lesion. We undoubtedly have a certain amount of œdema with a phlegmonous laryngitis, with perichondritis and other inflammatory affections. But the essential lesion in these disorders is inflammation, and the use of the term "œdema" in connection with them is misleading. In syphilis, tuberculosis, and occasionally in malignant disease of the larynx, the œdematous infiltration is entirely a secondary development.

Etiology.—The cause of the disease is to be found in some local or general condition outside of the larynx, under the influence of which a localized anasarca occurs. Any condition which may cause a dropsical effusion in other portions of the body may give rise to the same in the larynx. The most common cause is to be found in some form of renal disease.

Whether any local condition of the larynx exists which predisposes or invites the serous effusion into the laryngeal tissues, can only be a subject for speculation.

Quinke has described, under the name of "acute circumscribed œdema of the skin," a most curious affection, which is characterized by the sudden appearance, in different parts of the surface of the body, of circumscribed areas of œdema, which, persisting for a few days, subside, subsequently reappearing elsewhere. They are accompanied with a moderate amount of gastro-intestinal disturbance. This writer observes that the larynx may be invaded in the same way, and instances have been reported under the name of "angio-neurotic œdema of the larynx." The view taken is that the disease is essentially a vaso-motor paresis, the result of a general neurotic condition. The hereditary character of the affection has been thoroughly traced by Osler. Vogt and Tait have reported instances of œdema in the larynx in new-born children as the result of placental degeneration.

Pathology.—The essential lesion of the disease consists in the escape of liquor sanguinis from the blood-vessels, which diffuses itself in the submucous tissues of the lining membrane of the larynx, giving rise to an extensive swelling and distention of the parts, especially in those containing the largest amount of areolar tissue. As a rule, we meet with three distinct serous sacs, as it were, one on either side, formed by the distended ary-epiglottic folds, and one anteriorly, formed in the mucous membrane covering the epiglottis. The tumefaction of the ary-epiglottic folds extends downward to and involves the ventricular bands, the membrane covering the arytenoid cartilages and the commissure, while in front the œdema, starting on the posterior aspect of the epiglottis, mounts to the epiglottic crest, and passes over and is liable to extend as far as the glosso-epiglottic fossæ. In rare instances the œdema confines itself to the ventricular bands without invading the epiglottis.

An extension of this form of œdema to the true cords or to the parts beneath is an exceedingly rare occurrence.

Symptomatology.—The onset of the attack is sudden, and the first symptoms which the patient experiences are usually those attendant upon obstruction to respiration. The voice is not necessarily lost at the onset of the attack, although as the œdematous swelling invades the ventricular bands and arytenoid commissure, the vibrations of the cords are not only mechanically interfered with, but the movements of the glottis are markedly hampered. The prominent symptom of course is the dyspnœa; this has mainly to do with inspiration. The attempt to draw air into the lungs, therefore, gives rise to a somewhat noisy, stridulous sound. Pain is not usually present, although there is a sense of fulness and distention in the throat, together with a certain amount of difficulty and perhaps pain in deglutition.

The progress of the swelling is so rapid that extreme dyspnœic symptoms may set in, even a few hours after the first symptom, or at the latest probably in from twenty-four to thirty-six hours. After the stenosis is fully developed, we have the general resulting symptoms, such as cyanosis, restless movements, anxious expression of face, and other evidences of the suffering which ordinarily accompanies the distress for breath.

Diagnosis.—The subjective symptoms of laryngeal stenosis are usually so well marked that, as a rule, our main consideration is to determine the special form of laryngeal disease which is the cause of the symptom. This can be ascertained either by digital exploration or laryngoscopic examination. If the epiglottis is swollen, the insertion of the index finger will easily recognize the large, rounded, semi-

resisting mass beyond the base of the tongue. If the œdema is confined to the ary-epiglottic folds, digital exploration beyond the epiglottis would scarcely be tolerated, especially if any dyspnœa existed. In these cases a laryngoscopic examination should be made, as an ocular inspection of the parts alone will absolutely determine a differential diagnosis between pure œdema, the presence of a foreign body, perichondritis, or other possible causes of the obstruction.

The laryngeal mirror in position would bring into view the mucous membrane lining the larynx, presenting the two or three large, round swollen masses (see Fig. 135), according as the epiglottis is involved or not, encroaching upon the lumen of the larynx, and presenting between them the small triangular opening in the centre, through which respiration is carried on. The membrane presents a tense, semi-glassy aspect, of a grayish color and semi-translucent appearance, resembling somewhat the aspect of an ordinary mucous polyp. The œdematous character of the swelling should be easily recognized; practically there are no laryngeal lesions with which it need be confounded. Angio-neurotic œdema is preceded by cutaneous eczema.

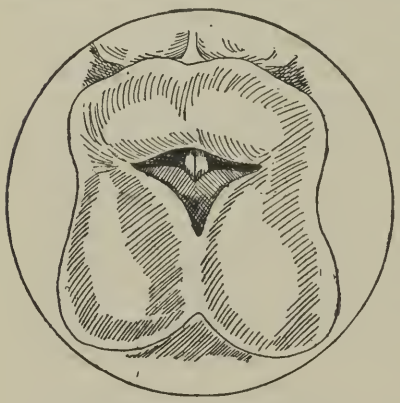

Fig. 135.—Œdema of the Larynx.

Prognosis.—An œdema of the larynx is simply the local manifestation of some grave organic disease, and the cases are rare in which a favorable change causes an arrest in the swelling. In any individual case, therefore, wherein a purely œdematous invasion of the larynx is recognized, we may anticipate that dangerous dyspnœa will ensue in a comparatively few hours, if it has not already occurred, unless our remedial measures are sufficiently prompt and efficient to arrest its further progress.

Treatment.—Our first endeavor should be to ascertain, if possible, the cause of the œdema, when prompt measures based on this should be instituted to prevent a further development of the disease. If the heart is at fault, and its action weak, one minim of either the fluid extract of digitalis or the tincture of strophanthus should be administered hypodermically. If there is kidney disease or cirrhosis of the liver, free action of the bowels should be obtained by the administration of half a grain of elaterium, or, as perhaps securing a prompter action, a drop of croton oil may be given; at the same time

free diaphoretic action should be secured by the hypodermic administration of one-eighth of a grain of pilocarpine. This latter dose may be repeated after an interval of from three to four hours, although it must always be borne in mind, in using this remedy, that it is a cardiac depressant and is liable to induce œdema of the lungs; hence its action should be watched somewhat closely, and, if the indications occur, alcoholic stimulants should be administered to counteract any observed unfavorable action on the heart.

The patient should be kept in a warm room, and in an atmosphere thoroughly surcharged with moisture by means of boiling water over a spirit lamp. Our main reliance for immediate and prompt relief lies in freely puncturing the serous sac and letting out the water, as described in the chapter on phlegmonous laryngitis. These scarifications should be made freely over the whole of the swollen surface, wherever tumefaction is found, and may have to be repeated at the end of two or three hours.

As regards catheterization, intubation, and the performance of tracheotomy, the same rules apply as have been given in the discussion of the treatment of phlegmonous laryngitis.

Œdema secondary to a tuberculous or syphilitic larynx very rarely attains proportions which demand local interference. In those instances, however, in which this complication occurs, the rules which govern our management of it are practically the same as those which govern an œdema dependent upon cardiac or kidney disease.

CHAPTER LXXXII.

CROUPOUS LARYNGITIS.

We have already discussed the question as to the duality of croup and diphtheria, taking the ground that the two diseases are separate and distinct, and that we meet with a group of cases which are characterized by fibrinous exudation in the larynx, and in which none of the septic features of diphtheria are present. This affection we designate as croupous laryngitis. As compared with diphtheria, it is an exceedingly rare affection; but that it does occur I am convinced, as the result of the careful study and observation of a number of instances of membranous laryngitis, in which the peculiar character of the membrane convinced me that they should not be included in the same category with a true diphtheria.

Etiology.—Although at the present writing the specific germ which gives rise to a croupous laryngitis has not been isolated and subjected to culture, I am quite as firmly of the belief that the disease is the direct result of the lodgement of a microbe in the fauces or larynx as that diphtheria occurs in this way. It is possible that this germ is closely related to, but not identical with that which causes diphtheria, the latter, however, being a microbe of infinitely greater activity. The lymphatic tissues in the fauces afford a convenient lodgement for disease germs, and it is here that in the very large majority of cases the primary deposit occurs, either in the faucial or pharyngeal tonsil. Whether the primary lodgement may occur in the larynx, we have no means of determining. I have seen no case, however, in which I could not demonstrate the existence of an exudation in the fauces before any evidence of laryngeal involvement was apparent.

I believe that a croupous deposit in the fauces, whether in the form of an acute follicular tonsillitis or of a croupous membrane on the tonsil, is to be regarded as presenting a certain amount of danger of causing a croupous laryngitis, even though this extension of the disease is one of rare occurrence.

We must recognize as the teaching of clinical observation that the croup germ is one of comparatively little vitality. It lodges upon

the faucial tonsil, propagates, and gives rise to an acute follicular tonsillitis. In doing this it has apparently exhausted its vitality in the vast majority of cases. In another case it lodges in the fauces and propagates with a greater activity than in the former, causing a diffuse membrane on the tonsils. In a certain proportion of cases, not so great as the former, the diseased process ceases without developing laryngeal complications. A membranous deposit on the tonsils is to be regarded as indicating a much greater danger of a croupous laryngitis than the follicular disease. Susceptibility constitutes another exceedingly important feature of the disease. While a croupous exudation in both forms is very common in adult life, true croupous laryngitis is rarely, if ever, met with.

The disease occurs sporadically and endemically, never probably epidemically. It is is not to be regarded as contagious in any greater degree than the milder forms of croupous exudation, such as acute follicular tonsillitis.

An ordinary catarrhal cold involving the upper air passages, while standing in no direct relation to a croupous inflammation, must be regarded as a somewhat active predisposing cause of the graver disease, the inflamed membranes affording a more favorable nidus for the lodgement and development of a disease germ.

Pathology.—The onset of croupous inflammation is marked by the same phenomena which occur in connection with catarrhal inflammation. It differs from catarrhal inflammation, however, in the fact that the escaping serum contains a large amount of fibrin, which, passing through the superficial layer of the mucous membrane, coagulates upon its surface. The increase of the nutritive processes is characterized by the proliferation of large numbers of epithelial cells, which are imprisoned by the fibrin, thus forming a false membrane on the surface, which is composed of large numbers of fibrinous fibrillæ, entangling in their interlacing meshes the proliferated epithelial cells.

It would thus seem that the specific germ, penetrating the tissues, sets up primarily a catarrhal inflammation, and, furthermore, either itself enters the circulation or gives rise to ptomains which make their way into the blood, causing a condition of hyperinosis, which so far dominates the local morbid process as to give rise to a fibrinous inflammation or exudation.

Symptomatology.—The disease is ushered in by a chill or notably chilly sensations. This is followed by an active febrile movement, which from the onset assumes the sthenic type. The temperature on the first day may range from 102° to 104° F. The skin is hot and flushed, and the pulse rapid and bounding. There is loss of appe-

tite, with pains in the bones, and the urine becomes scanty and high-colored. The child is restless and usually declines food, partially on account of the activity of the fever, and partially as a result of the painful symptoms which almost immediately develop in the throat. The parts feel dry, stiff, and sore, with perhaps a certain amount of external tenderness on pressure. The prominent local symptom, however, is a painful deglutition, each attempt being attended with sharp lancinating pains, which shoot toward the neck and ear. The febrile movement continues, and the range of temperature remains practically unchanged for from twenty-four to forty-eight hours. The local symptoms in the throat may be prominent or masked, according to the extent of the deposit on the tonsils. During the first day, or possibly not until the second or third, evidences of laryngeal involvement will show themselves in the impairment of voice, which may become hoarse and metallic in character at first, although this is soon followed by more or less complete aphonia, the voice being reduced to a hoarse whisper. Characteristic evidences of membranous deposit in the larynx soon follow, such as inspiratory and expiratory dyspnœa, the former being more pronounced and attended with subclavicular depression, cyanosis, pinched and anxious expression of the face, dilatation of the alæ of the nose, etc. The involvement of the larynx is liable to be marked by a certain accession of febrile movement, with an increase of temperature of from one to two degrees. The further history of the case consists in the rapid increase of dyspnœic symptoms and the final death of the child, unless the disease is arrested or the exfoliation of the membrane is secured by the therapeutic efforts at relief. The laryngeal involvement sets in usually as early as the second day, rarely beyond the fourth, and the disease runs its course somewhat rapidly, terminating in death or resolution in from three to six days.

Albumin is present in the urine in a certain number of cases. This, however, is not a feature of any special significance, as albuminuria is met with in acute follicular tonsillitis, as well as in most of the other acute infectious diseases.

Diagnosis.—A point of special importance lies in the differential diagnosis between croupous and diphtheritic inflammation. In the graver disease we have a thick, yellow, efflorescent false membrane, closely adherent to the parts beneath, and which cannot be separated from them without the rupture of blood-vessels, and furthermore the exudation at the end of twenty-four hours shows marked evidences of necrosis. The croupous membrane, on the other hand, is a clean, vital membrane, bluish-white in color, thin, but slightly raised above the parts beneath, and constitutes an entirely superficial deposit,

The special diagnostic point lies in the fact that it is easily detached from the parts beneath without the rupture of blood-vessels.

Laryngeal examination is not often feasible in very young children; but even if this were obtainable, as we have already seen, the fibrinous exudation in the larynx in diphtheria is practically a croupous membrane, and therefore one which differs in no great degree from the disease under discussion. Our diagnosis, therefore, will be based on the appearances observed in the fauces on direct inspection. I seriously question whether a case of laryngo-tracheal diphtheria, so called, ever occurs without a diphtheritic inflammation in the fauces. If such is not met with, I should be disposed to call the disease croupous laryngitis, although undoubtedly many good observers call these cases diphtheria. Any given case, therefore, with a faucial exudation which at the end of twenty-four or thirty-six hours has not assumed a diphtheritic character, must be regarded as a croupous disease.

In all cases, whether they resemble true diphtheria or not, a culture should be taken and submitted to bacteriological examination. In laryngeal cases, however, the failure to find the Klebs-Loeffler bacillus is not considered by some authorities as invariably a proof of the absence of diphtheria.

Prognosis.—The tendency to death in croupous laryngitis is entirely due to the dyspnœic symptoms. The patients die of suffocation, and not from the activity of the blood poison or the prominence of the febrile symptoms. In a majority of instances of true croup we are driven sooner or later to our last resource, namely, to open the air passages, a measure which is successful in but a very small proportion of cases in which the trachea and bronchi have been invaded, whether the case be croupous or diphtheritic in its origin.

Treatment.—Mercury exerts a somewhat specific influence upon fibrinous exudation. This drug, therefore, affords us better hope of controlling the exudation than any other. It should be administered preferably in the form of calomel or hydrargyrum cum creta in somewhat full doses from the onset of the disease, bearing in mind the tolerance of children for this remedy. For a child five years of age two grains of either of the above preparations should be administered, suspended in milk or some other suitable fluid, every two hours for the first twenty-four hours, or until the evacuations are rendered greenish in color and soft in consistency, after which it should be administered at less frequent intervals.

Next in value and importance to the preparations of mercury in this disease is the tincture of iron. This should be given in glycerin in the proportion of one part to eight, of which to a child five

years of age a half-teaspoonful is to be administered every two hours. Given in this form, the iron exerts a directly controlling action upon such local exudation as may exist in the fauces. Its systemic effect is of even more importance than this, in that the drug seems to possess certain specific properties in controlling that peculiar blood condition which we have heretofore spoken of as hyperinosis and which exists in so marked a degree in the disease under consideration. A better action, I think, of each drug is obtained by administering them alternately rather than in combination.

The indications for treatment, so far as the local exudation in the fauces is concerned, consists in the application of the liquor ferri persulphatis, the membrane being saturated with this drug applied by means of a pledget of cotton wrapped on a slender probe, and the application repeated every two or four hours, according to the progress of the case.

When the membrane develops in the larynx, a region which is practically not freely open to access for nice manipulation in these cases, and which cannot be easily inspected in young patients, we probably possess no method which is capable of arresting the progress of a fibrinous exudation after it has commenced. We may hope, however, in a small proportion of cases to bring about such rapid evolution of the membrane that exfoliation may take place before the patient succumbs from asphyxia. Our main reliance for the accomplishment of this lies undoubtedly in the inhalation of steam, and probably the best method of generating this is by slaking lime. The steam which arises during this process of hydrating the lime undoubtedly carries with it small particles of the chemical, which possibly may have some beneficial action upon the exudation. It is not necessary that these should be constantly used, but they may be repeated every four to six hours. During the intervals, however, and practically as long as the dyspnœic symptoms persist, the child should be subjected to the action of steam constantly generated from a spirit lamp. In order to best secure this, it should be covered with a tent, which can easily be arranged by means of sheets and blankets. Whether any additional benefit is derived by adding to the boiling water lactic acid, acetic acid, creasote, oil of tar, camphor, benzoin, cubebs, carbolic acid, thymol, iodine, turpentine, and other drugs, is open to question.

In former years, when all pseudo-membranous affections of the throat were designated as croup, emetics were very generally and extensively used in this disease; of late years and since the diphtheritic character of the large proportion of these cases has been recognized, emetics have fallen very largely into disuse, on the ground

that the harm that they are liable to do in a disease of such purely asthenic character as diphtheria more than counterbalances any problematical good. They may occasionally prove of value in a case of croupous exudation in enabling a child during the act of vomiting to detach an already loosened false membrane in the larynx and trachea and to expel it. In order that the emetic shall perform this service, it is easy to see that detachment must already in part have been accomplished. In order to be of any value, emetics must be resorted to with great discrimination and nicety of judgment. In selecting an emetic, preference should be given to the yellow subsulphate of mercury, or turpeth mineral. To a child five years of age, the dose should not be less than ten grains.

Pilocarpine not only increases diaphoresis through the cutaneous system, but also stimulates the mucous secretions. It is thought by some to promote the separation of the false membrane, an observation which seems to have been confirmed by a number of writers. The remedy is a somewhat powerful one, and should therefore be used with considerable caution. For a child five years of age, probably quite a safe dose would be a twentieth of a grain. This may be repeated at the end of from six to twelve hours, its effect being watched carefully.

Notwithstanding our remedial efforts, in a majority of cases the fibrinous exudation continues to develop, and dyspnœic symptoms of an increasingly grave character ensue, when the resort to surgical interference becomes imperative. It is scarcely necessary to add, that an early operation gives us the best hope of saving the life of the patient, for the long continuation of laryngeal stenosis, especially in a young child, tends not only to depress the vitality and recuperative power, but also induces conditions in the mucous membrane of the larynx and bronchial tubes which, to an extent, invite the extension of the fibrinous exudation. Considering that here we have to do with an exudation which is neither septic nor especially infectious in character, I think that there can be no question as to the advisability of the use of the O'Dwyer tube in preference to tracheotomy. This should be inserted immediately upon the development of any continuous dyspnœic symptoms. If from any cause the tube fails to relieve or is not easily retained in position, resort should be had to tracheotomy.

CHAPTER LXXXIII.

PERICHONDRITIS OF THE LARYNGEAL CARTILAGES.

The morbid changes which take place in the laryngeal cartilages have their origin in the perichondrium, a primary chondritis, so far as I know, not being met with.

From a clinical point of view, we meet with three varieties of morbid action in these tissues, namely, ossification, fibroid degeneration or chronic inflammation, and acute inflammation.

Our present consideration has mainly to do with acute perichondritis, which possesses an especial interest on account of the suddenness of its invasion, the gravity of the symptoms which attend its development, the great deformity to which the laryngeal cavity is subjected thereby, and especially the obscurity and difficulty of diagnosis which often confront the surgeon at a time when a prompt and definite diagnosis is a matter of no little importance.

Etiology.—A large proportion of cases occurs idiopathically, as the result of an exposure to cold, while among other exciting causes may be included typhoid fever, diphtheria, pneumonia, erysipelas, syphilis, and traumatism. We include syphilis among the exciting causes of the disease, for the reason that, when it arises from a specific lesion, it runs practically the same course as it does in other cases, although, of course, the indications for treatment are somewhat different.

Of the 33 cases which I have collated, including 2 occurring in my own practice, 9 were idiopathic, 9 were due to the syphilitic taint, 11 followed an attack of typhoid fever, 1 resulted from diphtheria, 1 was traumatic, and 2 were due probably to a lordosis of the cervical vertebræ pressing upon the cricoid cartilage. Excessive use of the voice has been suggested as a cause of the disease, and so has pressure of the cricoid cartilage upon the cervical vertebræ, and even the frequent introduction of the œsophageal sound.

Men are more frequently attacked by this disease than women.

Pathology.—The changes which take place in the tissue consist of an increase of the vascularity and cell production and the other changes, which characterize an ordinary attack of acute inflammation.

The further changes which take place may consist either in the formation of pus, which, burrowing beneath the perichondrium, separates it from the cartilages beneath, resulting in necrosis of the latter, or, in rare instances, the new cells may become organized, resulting in the development of a true hypertrophic process. This latter form of the disease is that which constitutes more properly a chronic perichondritis.

In most instances the disease primarily attacks and confines itself to a single cartilage, although occasionally all the cartilages of the larynx may be involved. When the arytenoid is attacked, it not infrequently extends to the cricoid. Of the 33 cases collated by the author, 23 involved the cricoid, 3 the thyroid, 4 the arytenoid, 1 the cricoid and thyroid, and in 2 cases all the cartilages of the larynx were involved. Schrötter places the order of frequency as follows: first, the arytenoids, then the epiglottis, then the cricoid, and last the thyroid. This is quite true if we include cases which are secondary to tubercular disease.

Symptomatology.—The onset of the attack is characterized by a feeling of general malaise, with chilly sensations, and in rare instances by a well-marked chill, followed by pains in the bones, headache, and loss of appetite, the thermometer indicating a temperature of from 100° to 101° F. Impairment of function, which is more or less prominent according to the special cartilage involved, soon develops. There is a sense of fulness or distention in the parts, together with tenderness on pressure, and in rare instances absolute pain, especially if the disease is of syphilitic origin.

The Cricoid.—If the cricoid cartilage becomes the seat of the disease, the perichondrium lining the inner surface of the cartilage is always involved, giving rise to extensive tumefaction and marked encroachment upon the breathing-space, in consequence of which dyspnœa becomes the most prominent symptom, setting in quite early in the attack, and interfering almost equally with inspiration and expiration. If the posterior face of the cartilage is involved dysphagia necessarily arises, on account of the pressure of the bolus of food on the inflamed tissue. Coincident with the occurrence of dysphagia, the voice becomes lost, or reduced to a hoarse whisper. This is in part due to the inflammatory action extending to the mucous membrane lining the lower portion of the larynx, but in the main is undoubtedly the result of an infiltration of the muscular tissue, thereby impairing the phonatory movements of the cords. This infiltration attacks the crico-arytenoid lateralis muscles more actively than the posticus, although in most instances probably both are to a certain extent involved.

Cough may be present, owing to the accumulation of mucus in the larynx, although this is rarely a troublesome symptom.

The acute symptoms may persist for a few days, when undoubtedly spontaneous resolution may occur, although I have met with no such case, and know of none such reported in literature. The usual course is either toward suppuration or hypertrophic changes. In either case the symptoms persist without much change.

The ultimate result of the morbid process is necessarily the necrosis of the cartilage and the formation of a sequestrum, which, being retained, becomes the source of pus formation, which discharges through fistulous openings either into the larynx or externally. This may be maintained for months or even years, until the sequestrum is finally thrown off or removed.

The Arytenoid.—If the arytenoid cartilage is the seat of the disease, it gives rise to a unilateral tumor, which encroaches upon both the air and food tracts, causing some dysphagia and a certain amount of dyspnœa.

In this form of the disease, the crico-arytenoid joint becomes the seat of an effusion, which results practically in an ankylosis, abolishing the movement of the cord on that side, causing the voice to become hoarse and notably lowered in tone. After the cartilage becomes necrosed, and a fistulous opening is established, the final exfoliation occurs in a much shorter period of time than in cricoid disease.

The Thyroid.—Perichondritis of this cartilage may involve the inner or outer face of the cartilage and one or both wings; in the large majority of instances, however, the attack involves the inner face, and is usually unilateral. The symptoms to which it gives rise are mainly impairment of voice and interference with respiration. The vocal impairment is due to the coincident involvement of the mucous membrane lining the larynx, in the inflammatory action and also the swelling of the perichondrium which projects into the cavity in the neighborhood of the ventricular band, thus interfering with the phonatory movements of the cord of the side involved. This, of course, only occurs when the inner face of the cartilage is invaded. If the disease is unilateral, the voice becomes hoarse and lowered in tone. If both sides are involved, the voice is reduced to a hoarse whisper. Where the inner face of the cartilage is involved, the area of inflamed tissue becomes somewhat extensive; the tumefaction, therefore, encroaches to a notable extent on the normal breathing-space, giving rise to dyspnœa, which in unilateral cases is a source of great distress to the patient, while in cases in which both wings of the cartilage are involved this becomes an exceedingly grave and

urgent symptom. When the disease attacks the outer surface, it results in notable external deformity, usually appreciated by inspection and palpation, while at the same time there is no little tenderness on pressure, and perhaps localized pain.

The involvement of both wings and both faces of the thyroid cartilage practically occurs only in those instances in which all the cartilages of the larynx are invaded, giving rise to a form of the disease which is attended with extensive destruction of tissue, and, as a rule, is followed by the ultimate death of the patient.

Ordinarily, however, an attack of thyroid perichondritis consists in the unilateral development of a localized inflammatory process in the perichondrum of one face of the cartilage, usually the inner. This process goes on to suppuration and the establishment of a fistulous opening, which discharges pus, either into the laryngeal cavity or anteriorly through the cutaneous tissues. This usually occurs near the median line in either case. After suppuration takes place, the tumefaction subsides to a certain extent, and this is followed perhaps by a slight amelioration of symptoms, although not marked.

The thyroid cartilage is much more abundantly supplied with blood-vessels than either the cricoid or the arytenoid; hence, a thyroid perichondritis is not liable to result in such extensive cartilaginous necrosis as occurs in the other cartilages. We are more apt to have a superficial necrosis, in which the affected portion disintegrates and is discharged; hence, after a period of a few months or perhaps a year, the suppurative process gradually diminishes, and the parts heal without any serious loss of tissue or permanent impairment of phonation.

The Epiglottis.—This organ, being a fibro-cartilage, never becomes the seat of a process similar to that already described. Perichondritis of this cartilage does not result in an abscess with necrosis, but rather in an ulcerative action; moreover, this is rarely if ever idiopathic, but is only secondary to tuberculosis, syphilis, carcinoma, and other destructive diseases.

Diagnosis.—The suddenness of the onset of the attack, together with the general febrile disturbance which accompanies it, indicates that we have to deal with an acute inflammatory disease. When we consider, therefore, that the only acute inflammatory affections giving rise to dyspnœic symptoms which are accompanied by febrile disturbance are perichondritis, croupous exudation, and acute submucous laryngitis, it would seem that the diagnosis in these cases should not as a rule be obscure; and yet, as a matter of clinical experience, the diagnosis is, in the large majority of instances, involved in no little uncertainty, even after the case has been studied and observed for some days.

The onset of a croupous laryngitis is generally characterized by more marked chilly sensations, while the febrile disturbance is far more active, the temperature usually running from 102.5 to 104° F. Moreover, if a croupous exudation is not discovered in the fauces, the laryngoscopic mirror should serve to reveal it. A submucous laryngitis gives rise to a notable tumefaction of an inflammatory character, involving the mucous membrane symmetrically on both sides of the larynx; whereas a perichondritis develops a tumefaction presenting all the aspects of acute inflammation, which extends more or less to the mucous membrane of the surrounding parts, and yet it is confined, as a rule, to one side of the larynx and is usually irregular in outline and distinctly asymmetrical. The obscurity in diagnosis lies in part, perhaps, in the fact that one is called to these cases usually in an emergency, and when the examination is made an uncertainty remains as to whether some obscure growth or malignant disease may not have existed without giving rise to symptoms for some time before the development of the acute attack.

FIG. 136.—Laryngoscopic Image in Perichondritis of the Cricoid Cartilage.

Our diagnosis, therefore, must be based on the exclusion of other acute affections and the character of the febrile disturbance, together with ocular inspection by the laryngeal mirror. If the cricoid is involved there will be found a distinct tumefaction, irregular in outline, nodular in character, projecting into the subglottic portion of the larynx and encroaching upon the breathing-space, as seen in Fig. 136. The whole aspect of the case indicates an acute inflammation which involves the mucous membrane covering the tumor and extends to the parts above the glottis. While the tumor is practically below the cords, it gives the appearance of projecting somewhat into the supraglottic larynx, crowding up the arytenoid and vocal cord in such a way that the latter is brought into apposition with the ventricular band, thus more or less completely obliterating the ventricle. The movements of the larynx on the side affected are also notably hampered or practically abolished.

One's first impression, on examining a case of this kind, is of a very extensive distortion of the laryngeal cavity; a careful study,

however, of the regional anatomy by means of the laryngeal mirror should aid one materially to outline the distinct tumefaction, having its origin on the posterior segment of the cricoid, which is the part primarily involved in the large majority of cases. Extensive tumefaction is also found when one of the arytenoid cartilages is the seat of attack. Tuberculosis, the only condition liable to be confounded with this disease, is usually bilateral and exhibits minute, scattered, whitish-gray points on a grayish-pink membrane, while idiopathic perichondritis is purely inflammatory.

If the thyroid cartilage is involved externally, the condition should be recognized by palpation and inspection, together with the careful analysis of general and local symptoms. When the inner face is involved, it gives rise to a distinct circumscribed tumefaction, projecting directly into the laryngeal cavity, near the ventricular band, encroaching somewhat on the breathing-space, and practically hiding the true cord. The local inflammatory process, as a rule, should serve to eliminate all neoplasms.

Prognosis.—These cases run a somewhat protracted course, and yet they involve no special tendencies toward a fatal termination, other than as the result of laryngeal stenosis, which, of course, can be obviated by the prompt introduction of a tracheal tube. In those rare cases, however, in which all the cartilages of the larynx are involved, death almost invariably results in the course of a few months. These cases of general invasion of the laryngeal cartilages are usually secondary to tuberculosis, carcinoma, or some other systemic disease, and hence, while the cartilaginous affection is a contributing cause, it is not always to be regarded as the active cause of the fatal issue.

While the disease is not fatal, the ultimate result as to the voice and respiration becomes an interesting question in prognosis. The great danger of permanent respiratory obstruction is shown by the fact that of seventy cases compiled by Lüning which survived tracheotomy, in sixty the permanent wearing of the tracheal tube became necessary. It should be remembered, however, that these were all cases which followed typhoid fever, persistent laryngeal stricture being particularly characteristic of that form of the disease which follows typhoid.

Cases of thyroid perichondritis run a somewhat more rapid course than cricoid. The sequestrum which forms is liable to disintegrate, and be expelled through the natural passages, or a large sequestrum may form which demands operative interference. One of the remote dangers which this form of disease involves is the burrowing of pus beneath the deep tissues of the neck, into the anterior mediastinum, giving rise to suppurative inflammation in this space.

The arytenoid form of the disease results in a destruction of the cartilage, which is ordinarily expelled through the natural passages. The prominent result is usually a permanent ankylosis of the crico-arytenoid joint, which gives rise to a certain amount of vocal impairment. The principal danger of this form of disease is in its extension to the cricoid.

Treatment.—The treatment of the acute stage of the disease consists of active general and local antiphlogistic measures. Most important of these, perhaps, are ice packs, or Leiter's coil, applied externally, together with the internal administration of pellets of ice, and local blood-letting by means of leeches or wet-cupping. Schrötter suggests the use of absorbents, such as mercurial ointment, iodoform, or iodol ointment, applied externally, or a solution of iodine and glycerin applied to the mucous membrane of the larynx. If the pain is great, Magendie's solution of morphine or a ten-per-cent solution of cocaine may be sprayed into the laryngeal cavity.

In addition to the above, the bowels should be acted upon freely by the administration of a full dose of either blue mass or calomel, followed by a mild saline cathartic.

Iodide of potassium should be administered in all cases, at the onset of the acute stage, and persisted in for a considerable period after the acute symptoms have subsided.

Our later treatment of perichondrial inflammation consists in measures for the relief of the dyspnœa, the performance of tracheotomy when demanded, the management of the sequestrum, and, finally, the relief of the resulting stenosis. When it becomes necessary to open the air passages, laryngotomy should be done in preference to the low operation, in that this not only secures a certain amount of local blood-letting, but also leaves an opening through which access can be more readily obtained to the sequestrum in the case of cricoid perichondritis, and to purulent accumulations which may form in case the thyroid is the part involved.

The case should be watched for the formation of a sequestrum, and measures taken to remove this as soon as it has become detached from the diseased perichondrium. The presence of the sequestrum undoubtedly stimulates connective-tissue formation; the longer it remains, therefore, the more extensive is the permanent deformity and stenosis which may be anticipated. Its early removal, therefore, becomes a matter of no little importance.

A cricoid sequestrum may be removed through the tracheal opening, although a much safer procedure would be to enlarge the opening either vertically or laterally. A safer procedure still, perhaps, would be the reinsertion of the tube lower down, especially if the

sequestrum is large. In a case reported by Hjort a large thyroid sequestrum was removed by thyrotomy.

One of the most important measures for the preservation of the voice and restoration of the breathing-space, I think, consists in the use of a Luer valve in connection with the tracheal tube. This is especially valuable when there is ankylosis of the crico-arytenoid joint, as considerable motion results from the forcible expiration which is accomplished by this device.

The severing of the adhesions by the intralaryngeal knife and the dilatation of strictures by bougies are indications which may be carried out in individual cases. At best, a larnygeal stricture following a perichondritis is a condition which, as we have seen before, will often baffle our most skilful efforts. In one case reported a large portion of the larynx was extirpated and an artificial organ introduced, to the great comfort and relief of the patient.

CHAPTER LXXXIV.

LARYNGEAL HEMORRHAGE.

Under this term we include cases of rupture of the blood-vessels of the larynx, with escape of blood into the submucous tissues, giving rise to hæmatomata, and also those in which the blood escapes through the surface of the mucous membrane, causing an hæmoptysis.

In former days all cases of hæmopytysis were generally considered as indicative of pulmonary disease: the introduction of the laryngoscope, however, enabled observers to recognize the laryngeal mucous membrane as a not infrequent source of hemorrhage.

Etiology.—The frequent use of the term laryngitis hemorrhagica testifies to the fact that many writers believe that inflammation of the laryngeal mucous membrane forms an essential part of this affection. I think that the frequency of catarrhal laryngitis and rarity of hemorrhage of the larynx force us to the conclusion that a simple inflammatory process is not even an actively predisposing cause, and I consider "laryngeal hemorrhage" the better term, as defining the chief symptom of the disease without misleading us as to its origin. A careful study of the reported cases would seem to indicate that general conditions have quite as much influence in causing the attack as local lesions. Among the former are the hemorrhagic diathesis, cirrhosis of the liver and dilatation of the heart, the general debility of phthisis, and anæmia and malnutrition, vicarious menstruation and pregnancy. In many instances the attack comes on while the patient is in the enjoyment of perfect health, and it is often difficult to ascertain the real cause of the bleeding. Slight erosions in the larynx undoubtedly may occur, and be the site of ruptured blood-vessels and consequent hemorrhages.

There are, however, but few localities in the upper air tract where erosions occur; one of these is on the anterior face of the arytenoids, and in many instances the escape of blood has been traced to this point.

Among the exciting causes of the attack may be noted the straining of the voice in excessive use, especially when it has been weakened from any cause. Coughing, vomiting, straining, violent exercises

and other acts which induce superficial plethora may also lead to a rupture of the laryngeal blood-vessels. That an acute laryngitis may in rare instances prove the exciting cause is illustrated in a case of Fränkel's, in which a hemorrhage seemed to be the direct result of the laryngeal inflammation.

Pathology.—The escape of blood may be beneath the surface, constituting an extravasation, or the hemorrhage may be the result of a rupture of blood-vessels on the surface of the mucous membrane, giving rise to an hæmoptysis.

It usually occurs over a somewhat limited area or even at a single point.

As we have already seen, it does not occur as the result of predisposing local causes, but is rather a diapedesis.

If it is the result of an erosion of the mucous membrane, this is most likely to occur at the posterior insertion of the cords or on the anterior face of the arytenoid cartilage.

According to Brown-Séquard, vasomotor disturbances of the mucous membrane may constitute a prominent predisposing pathological condition.

Of course an opportunity for a careful investigation of the local condition is rarely afforded, in that the disease is probably never fatal. In one case, however, the patient died of natural causes, and minute investigation revealed vascular plethora, with an extravasation of red blood corpuscles, thus clearly indicating diapedesis, which in this case was the result of cirrhosis of the liver and cardiac dilatation.

Symptomatology.—If the case is one of simple extravasation or concealed hemorrhage, the symptoms consist of a sense of irritation in the larynx, with a possible disposition to cough, and alteration or loss of voice, with dyspnœa if the hæmatoma encroach upon the breathing-space.

If the hemorrhage is an open one, the prominent symptom is hæmoptysis. The blood comes up easily, and with slight effort at clearing the throat. It appears in small masses or streaks unmixed with saliva or mucus, which distinguishes it to a certain extent from pulmonary hemorrhage. When it is small in amount, it may lodge in the larynx and become clotted, in which case it is expelled, of course, in the form of dark-colored masses, and may continue for days without great variation in amount.

A profuse hemorrhage from this region is rare and dyspnœa is seldom present.

Diagnosis.—The important element of diagnosis is in determining whether the source of the hemorrhage be from the lungs or the

upper air tract. Instances are not rare in which hemorrhage from the nose or naso-pharynx has given rise to an hæmoptysis, the blood trickling down to the lower part of the pharynx or even into the larynx, and being subsequently expectorated. It becomes important, therefore, not only to make a laryngoscopic but a rhinoscopic examination. Additional evidence is established, of course, by an examination of the lungs. Furthermore, in pulmonary hemorrhage, the blood is usually thoroughly mixed with mucus, while in a laryngeal hemorrhage it is entirely distinct. If the blood is expectorated in inspissated or dry clots, this would always indicate the larynx or the parts above as its source.

Course and Prognosis.—It involves, in itself, no very grave danger to life. So far as I know, a fatal case of laryngeal hemorrhage has never been reported.

Treatment.—If the case is one of concealed hemorrhage or hæmatoma, in which the tumor gives rise to notable symptoms, the mass should be opened. In those cases in which there is open hemorrhage, the loss of blood is generally easily controlled by the local application of some simple and unirritating astringent, as follows and in the order of preference:

Ferri et aluminis sulphas, ...	gr. x. to the oz.
Liquor ferri persulphas, ...	℥ x. to the oz.
Acidum tannicum, ...	gr. xx. to the oz.
Argenti nitras, ...	gr. v. to the oz.

The application should be made preferably by means of the laryngeal atomizer, and repeated once or twice daily, according to the severity of the attack.

The use of the voice should be interdicted, and the patient directed to avoid all exercise as far as possible, while at the same time the food should be bland and unirritating. Warm or highly seasoned food and drinks should be forbidden. Pellets of ice held in the mouth, or ice applied externally to the neck, will be found especially serviceable.

If the cough is troublesome, or the disposition to clear the throat, as the result of the laryngeal irritation, is not controllable, opiates should be administered with a certain amount of freedom. The use of tobacco or alcoholic stimulants is of course to be avoided.

The internal administration of ergot, preparations of iron, sulphuric acid, and those remedies which are supposed to have a systemic effect on hemorrhage may be made, if the amount of blood lost becomes in any degree serious, although, as a rule, the action of these remedies is not greatly to be depended upon.

CHAPTER LXXXV.

SYPHILIS OF THE LARYNX.

The manifestations of this disease which are met with in the larynx are: 1. The primary lesion; 2. Erythema; 3. The mucous patch; 4. The superficial ulcer; 5. The gummy tumor; 6. The deep ulcer; and 7, Cicatricial stenosis.

The Primary Lesion.

So far as I know, but a single case of chancre of the larynx has been reported. It was followed soon by secondary manifestations, and seems to have presented no local features which differed essentially from an ordinary buccal chancre.

Erythema of the Larynx.

This manifestation of syphilis belongs to the secondary stage of the disease, and may develop as early as from four to six weeks after the primary lesion, although it occurs usually from the fourth to the sixth month. In rare instances its appearance may be delayed as late as two years or even later.

From a pathological point of view, it is closely analogous to the cutaneous erythema, but it is not usually coincident with it, being more liable to develop after the cutaneous eruption has subsided. Like all syphilitic invasions of the larynx, it comes on somewhat insidiously and without marked subjective symptoms. If the vocal cords are involved, the voice is apt to be impaired or perhaps completely lost. There is no localized pain or difficulty in deglutition; in fact, both the subjective and objective symptoms are confined to a certain amount of impairment of function.

Pathology.—The essential pathological tension which constitutes this manifestation of syphilis consists in a more or less dense infiltration of the mucosa with embryonic or round cells, giving rise to a certain amount of swelling of the tissue, but the most marked change

which seems to result from this infiltration consists in an interference with the return circulation of blood, whereby there results a notable amount of venous turgescence. This infiltration may diffuse itself somewhat equably through the lining membrane of the larynx, giving rise to a uniform hyperæmia, or in rare instances it may be distributed in circumscribed areas, thus occasioning an irregular vascular plethora, which gives to the membrane a somewhat mottled appearance. We can thus easily appreciate the characteristic difference between an acute catarrhal inflammation of the laryngeal membrane and a syphilitic erythema, in that the first change which occurs in the inflammatory process consists of vasomotor paresis and the dilatation of blood-vessels. This is followed by cellular infiltration, the whole process being directed by certain influences exerted upon the vasomotor centres. In the syphilitic disease, on the contrary, the cellular infiltration comes first, and the vascular disturbances are secondary. The mucous membrane on the posterior surface of the epiglottis and of the ventricular bands and ary-epiglottic folds is usually involved, while in rare instances the vocal cords themselves are invaded. Fournier describes a protoplastic form of this disease in which the parts are much more swollen, the subjective symptoms more prominent, and localized prominences are occasionally observed.

Diagnosis.—Our main reliance in diagnosis by ocular inspection lies in the peculiar dusky, sombre hue of the membrane, which is of a dark red, somewhat purplish tint, in contradistinction to the bright red, scarlet color which is characteristic of an acute idiopathic inflammation. If the infiltration occurs in circumscribed areas, giving rise to that peculiar mottled appearance in the membrane already described, the evidence of a specific taint should be more clearly recognizable. In this form of the disease we still have the diffuse venous turgescence, with its dark red or purplish color, but this is intensified in circumscribed areas, varying in diameter from one to four lines. The hyperplastic form, with its characteristic color and its extensive and uniformly diffused swelling, should not easily be mistaken for any simple inflammatory process either of the mucous membrane or the perichondrium. Aside from the above considerations, we have no definite method of recognizing a syphilitic erythema other than by the clinical history of the case and the success of internal medication.

Course and Prognosis.—The disease is one which disappears promptly and quickly under the influence of appropriate constitutional treatment, but if neglected may remain for weeks or months in the same stage, without, however, developing any graver manifestation of syphilis.

The Mucous Patch.

This lesion, like the former, belongs to the secondary stage of syphilis and is one of its exceedingly rare manifestations in the larynx; indeed, the possibility of its occurrence has been questioned. That it may develop, however, in this region cannot be doubted, in view of the fact that instances of this sort have been recorded by many and competent observers.

It may occur as early as six weeks after the primary invasion, or its appearance may be delayed for twelve months or even longer.

Its most frequent site is on the upper surface of the vocal cords. It may also occur on the epiglottis, arytenoids, and ventricular bands.

It gives rise to no pronounced symptoms other than those which may depend on its location. If the cords are affected, the voice is impaired; while if the patch appears near the free border of the epiglottis, some slight pain in swallowing is experienced. It seems to set up no secondary inflammatory changes.

The pathological lesion which constitutes a mucous patch has already been fully discussed elsewhere. It seems to manifest the same tendencies here as observed elsewhere, both in its persistence and tendency to recurrence. It may occur single or the lesion may be multiple.

Diagnosis.—The main interest of this lesion of syphilis has to do with the question of diagnosis. The mucous patch in the larynx should be recognized by the same appearances which are characteristic of a similar manifestation of syphilis in other portions of the air tract.

The Superficial Ulcer.

This lesion of syphilis belongs also to the secondary stage of the disease, and occurs usually from two to seven years after the primary sore. It may develop from a mucous patch or be primarily the result of the breaking down of a superficial gummatous infiltration.

The clinical features and pathology of this form of ulceration have already been so fully discussed in the previous chapters on syphilis of the nose and pharynx that it is not necessary to enter on the consideration of the disease here further than to state that a laryngeal ulcer of this variety presents the same general features and runs much the same course as in the parts above.

A superficial ulcer is a somewhat rare form of laryngeal syphilis, and it is mainly important from a diagnostic point of view, and as indicative of the activity of the specific virus in the system. Its

prominent features under ocular inspection are the same as those of the nose and pharynx, already described.

The possibility of syphilis developing in connection with a tuberculous process should always be borne in mind, two instances of this kind having been reported.

The Gummy Tumor.

While the larynx may be invaded by any form of syphilis, from the primary lesion to the deep ulcer of the later stages, in the very large majority of instances in constitutional syphilis the part remains intact until from five to ten years, or even longer, after the primary sore, when it becomes the seat of a gummatous deposit involving the deeper tissues of the mucous membrane and periosteum.

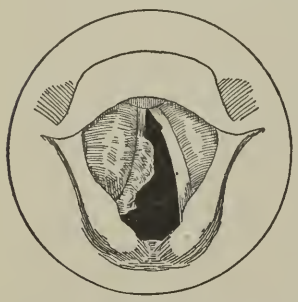

Fig. 137.—Gummy Tumor of Left Vocal Cord.

Owing probably to the fact that the larynx is the seat of constant functional activity, a gummatous infiltration in the majority of instances breaks down so rapidly that when the lesion is first observed the ulcerative process is fully established. Occasionally, however, from some obscure reason, the breaking down of the tissue is delayed, and the lesion presents itself either in the form of a single or multiple tumefaction or of a diffuse infiltration.

Symptomatology.—A gummy tumor consists of an infiltration of the deep layers of the mucosa, which may extend also to the perichondrium, in which case the subjective symptom of pain becomes a rather prominent feature of the attack. When the soft parts are involved, such as the ary-epiglottic folds or ventricular bands, the localized pain is not liable to be so prominent, although the pressure to which the parts are subjected during the act of deglutition may give rise to a certain amount of uneasiness. This also occurs when the posterior walls of the larynx are invaded. The voice is impaired according as the movements or contour of the vocal cords is affected. If the tumor encroaches on the respiratory tract, dyspnœa necessarily ensues, or this symptom may arise in consequence of an œdema set up by the presence of the growth.

Diagnosis.—A gummy tumor, whether single or multiple, presents in the form of a smooth, symmetrical, rounded tumefaction, which is ordinarily covered with healthy mucous membrane. It appears somewhat suddenly, and when it has attained its full development remains stationary, unless softening and ulceration occur. If the

membrane covering the tumor is inflamed, this is usually, probably, to be attributed to other and ordinary causes. The growth may vary from the size of a pinhead to that of a large cherry, and may occur in any portion of the larynx. The rapidity of the development, together with the subjective symptoms and the clinical history of the case, in connection with the smooth rounded outline of the tumor, should always give rise to a suspicion of syphilis; and, whereas ocular inspection may not always enable us to establish a definite diagnosis, the effect of the administration of the iodide of potassium will in the course of a comparatively few days determine whether we have a gummy tumor to deal with.

Course and Prognosis.—The tendency of a gummy tumor is to break down into ulcerative action, though in certain cases this may be absent, or delayed for months and even years.

The Deep Ulcer.

This lesion of syphilis belongs to the tertiary stage of the disease, and rarely occurs under five years after the primary sore, and in a majority of cases probably after ten years have elapsed.

It results from the breaking down of a gummatous deposit which has invaded the deep layers of the mucosa proper.

In all forms of syphilitic disease in the larynx, the invasion is somewhat insidious, and the lesion may exist for a considerable period of time without giving rise to subjective symptoms proportionate to the gravity of the local morbid process. A certain amount of local pain, with perhaps tenderness on pressure, may attend the primary deposit, or impairment of voice or complete aphonia may be present. The occurrence of ulceration, however, is attended with a notable amount of secretion of muco-pus. This contains an admixture of shreds of black, necrotic tissue, and is usually in the early stages streaked with blood. Hemorrhage to any appreciable amount is an exceedingly rare event.

The gummy tumor may so far encroach upon the air passages as to cause dyspnœa. After the ulcerative stage, however, interference with respiration does not usually occur, except in those rare instances in which œdema supervenes, and even when this develops it rarely attains such proportions as seriously to encroach upon the respiratory passages.

This form of ulcer occurs, in the order of frequency, upon the epiglottis, the vocal cords, the ventricular bands, and the arytenoid commissure. When it attacks the soft parts, it is usually unattended with any complications other than a limited amount of œdematous or

vascular tumefaction. When it occurs in the neighborhood of the cartilages, as near the arytenoids or the cricoids, the primary infiltration is liable to extend to the perichondrium, giving rise to an attack of perichondritis. If this be sufficiently extensive, necrosis necessarily follows. Destruction of one or the other of the arytenoid cartilages in this manner is a frequent complication. The evidence of this complication lies in a certain amount of pain in deglutition, with swelling of the membrane covering the cartilage, together with impaired mobility of the cords and perhaps dyspnœa.

If the perichondrium of the cricoid becomes infiltrated and a perichondritis is set up, there is localized pain, with tenderness on pressure, increased impairment of voice, but, most prominent of all, of course, is the dyspnœa, which develops rapidly and in a majority of instances very soon renders tracheotomy necessary.

Fig. 138.—Destruction of Epiglottis from Syphilitic Ulceration.

The epiglottis is very frequently the seat of the tertiary ulcer, but, it being a fibro-cartilage, we have simply a process of caries, by which the organ is destroyed by a process of erosion (see Fig. 138). Perichondritis is a complication of the later stages of the tertiary ulcer. After the gummatous infiltration occurs, the disease becomes to an extent local; the ulcer cicatrizes, a certain amount of contraction ensues, with impairment of the function, and a period of several months of immunity may elapse. Then another outbreak occurs; new gummatous material is deposited, which undergoes ulcerative action. So long as the case is neglected, or the disease not eradicated, the progress of the affection is characterized by these recurrent attacks. During the early years of a laryngeal invasion these relapses are characterized, as a rule, by simple attacks of ulceration. During the later years, when the organ has been permanently impaired, its lumen notably encroached upon by cicatricial contraction, its blood-vessels hampered, and its nutrition interfered with, deeper structures are invaded, and we have ulcerative processes complicated by perichondritis and necrosis.

It is in this later stage of tertiary syphilis oftener than in the earlier years that we meet with localized œdema, and yet in my experience œdema plays a comparatively unimportant part in laryngeal

syphilis, and instances are exceedingly rare in which this complication has given rise to grave symptoms.

The pathology of the gummy tumor, with the manner in which ulceration arises from an *endarteritis obliterans*, has already been sufficiently discussed in a former chapter.

Diagnosis.—The recognition of the deep ulcer, with its sharp-cut edges, dark red areola, excavated surface, and the profuse purulent secretion admixed with necrotic tissue, should ordinarily present no great difficulties. In tuberculous disease we have no areola, marked pallor of the mucous membrane, a whitish-gray ulcerated surface, flush with the surrounding membrane, no depression, and a scanty secretion of ropy mucus.

In lupus we have the irregular contour, highly injected membrane, but no ulceration, no secretion of pus, and no exfoliation of necrotic tissue.

In sarcoma we have a distinct tumor, with perhaps an eroded surface, but no distinct ulcerated surface with pus secretion.

In carcinoma we have a hard, nodular tumor, with a ragged ulceration, the edges of which are not sharply cut; the ulcerated surface does not present the crater-like aspect of syphilis; we have the tendency to hemorrhage, and no well-marked areola. Furthermore, in the ulcerative stage of carcinoma we ordinarily find the large, swollen cervical lymphatics, together with, in most instances, the peculiar cancerous cachexia.

Prognosis.—The prognosis in the early stages of laryngeal syphilis is fairly good as regards an arrest of the disease, and yet I think in tertiary laryngeal syphilis it is well to be somewhat guarded in giving an opinion as to ultimate success of treatment, especially as regards the complete restoration of function.

Cicatricial Stenosis.

The stenosis of the larynx which occurs in the late stage of syphilis is the result of a previously existing ulcerative process.

When the cicatrized tissue undergoes contraction, the normal contour of the larynx is to an extent destroyed, its lumen distorted, the breathing-space notably encroached upon, and the vocal function seriously impaired.

Some observers have entertained the view that the lesion occurred as the sequence of a deep-seated infiltration setting up a sort of submucous laryngitis, which in its late stages developed the laryngeal stenosis without ulceration. I have never seen any case of this disease in which the gross appearance of the parts did not warrant

me in regarding the stenosis as due to a contracting cicatrix following a tertiary ulcer.

The symptoms to which the condition gives rise are impairment of voice and interference with respiration. Cough, with increased secretion, if present, should be regarded as an evidence of disturbance of the air passages lower down. Localized pain or tenderness on pressure may occur with the fresh syphilitic outbreaks, and are to be regarded as more directly symptomatic of a new gummatous deposit. Difficult or painful deglutition may be either due to coincident infiltration of the pharynx or parts above, or it may arise from a fresh gummatous deposit in the posterior wall of the larynx. The voice may be either simply impaired or completely lost, the patient being compelled to articulate in a whisper; yet in either case we have that coarse, harsh, raucous tone which to an experienced ear is characteristic of late laryngeal syphilis. Dyspnœa usually attends both inspiration and expiration, although it is usually more marked in the former, owing to the fact that during this act the softer tissues above the vocal cords are apt to roll in, in a valve-like way, as it were, upon the glottis, thus increasing the stenosis. The dyspnœa is increased on exertion, as is the case in all form of laryngeal stenosis. In the earlier stages of the disease this symptom is not very prominent, but the narrowing of the larynx increases slowly but surely, as the result of the persistent contraction of the connective tissue which forms the cicatrix.

The clinical history of the case is liable to be marked by fresh outbreaks of gummatous infiltration followed by ulceration, under the influence of which the stenosis is still more markedly and permanently increased, although undoubtedly in many instances a notable laryngeal stricture may develop after a single attack.

Diagnosis.—The existence of a typical tertiary ulcer should render the diagnosis a comparatively simple matter. When we have to do with a pure cicatricial contraction without ulceration, the ravages of the disease present certain characteristics which to an experienced eye are unmistakable. No destructive ulcer in the larynx gives rise to such peculiar distortion of the organ as the cicatrices which follow the deep ulcer of syphilis.

Practically the only disease with which syphilis of the larynx should be confounded is lupus. Our main reliance in making a differential diagnosis will lie in the fact that lupus does not take on true ulcerative action, and is never marked by the large bundles of cicatricial tissue which are seen in the cicatrices of syphilitic disease. The clinical history will help clear up the diagnosis.

It is by no means an easy matter, and perhaps not an important

one, to locate definitely the point of the stricture, for the reason that the whole cavity of the larynx is so completely distorted by the disease. The ventricular bands are thickened, and usually adherent to the vocal cords, while the opening into the ventricles is obliterated. Both the true and false cords are more or less adherent, especially anteriorly, while the epiglottis is drawn down upon the larynx in such a way as largely to prevent careful inspection of the parts below. If the epiglottis has been involved in the ulcerative action, it is liable to be more or less completely destroyed, when the entrance of the larynx above presents a more or less rounded and ragged-looking circle, below which we see, in a progressively narrowing space, the ventricular bands merged into the true cords, and covered here and there with cicatricial bands, separated by areas of puffy, purplish-colored mucous membrane. Adhesions between either the true or false cords generally occur anteriorly, thus leaving a narrowed breathing-space in front of the posterior commissure (see Fig. 139).

Fig. 139.—Cicatricial Stenosis of Larynx, the result of Syphilitic Ulceration.

Even in the comparatively early stage of the disease the crico-arytenoid articulation is largely involved on one or both sides, resulting in a fixation at or near the median line, thus giving rise to a condition which materially increases the stenosis. The occurrence of this fixation in the median line, as is the rule, is probably due to the fact that the abductor muscles are weaker than the adductors.

Course and Prognosis.—The clinical history of laryngeal syphilis, if we embrace its sequelæ, is essentially a protracted one. If the disease is recognized at its onset and subjected to proper treatment, it may be arrested; but if the original gummatous infiltration has been extensive and ulceration has ensued, a certain amount of destruction of tissue is the necessary result, and still further cicatrization and contraction must follow; no local or general treatment can control this.

The disease, of course, involves no dangers to life other than through the occurrence of suffocation, and this can always be avoided by an early resort to tracheotomy.

Treatment of Laryngeal Syphilis.

The Primary Ulcer.—All authorities unite in the view that the primary sore presents no indications for treatment, a better procedure being to await the development of secondary manifestations.

Erythema.—This lesion yields promptly to the administration of general remedies, after the manner already discussed. If the local process assumes an aggravated form, the same topical applications are indicated as those recommended in the treatment of a simple acute catarrhal laryngitis.

The Mucous Patch.—The mucous patch in the larynx does not possess the same tendency to spread as when it occurs on the soft palate and pharynx, nor does it seem to be of the same persistent and recurrent type.

Apparently it yields promptly to internal medication. If, however, there should be any indication for local treatment, it is to be treated by cauterization in the same manner as a mucous patch elsewhere.

The Superficial Ulcer.—This lesion is to be treated by cleansing lotions and local applications of iodoform or europhen; nitrate of silver in a sixty-grain solution has also been recommended.

The Deep Ulcer and Gummy Tumor.—These lesions are to be treated after the manner already described in a previous chapter. Some recommend inhalations of corrosive sublimate, from 1 part in 1,000 to 1 in 500, in all forms of syphilitic ulceration, administered by means of the ordinary atomizer or by the globe inhaler.

Cicatricial Stenosis.—No internal medication is of any avail either in preventing the stenosis or in relieving it after it is developed. The iodides, moreover, are actually harmful, causing an iodic laryngitis, in which the dyspnœic symptoms are often dangerously aggravated. I am disposed to think that there is an especial danger in syphilitic laryngitis of this accident occurring, for whereas I have never seen an acute laryngitis excited by the administration of iodide of potassium when the larynx was in a healthy condition, I have in several instances observed it in laryngeal syphilis.

I think we must consider this form of stenosis of the larynx as practically one which is to be treated in much the same manner as a stricture of any other tract, viz., continuous dilatation, divulsion, and section; and practically these are the same measures which are to be resorted to in dealing with this form of laryngeal stenosis.

The first to employ systematic dilatation in these cases was Schroetter, who devised a series of metallic bougies for use in cases in which a tracheotomy had already been done.

The dilatation by means of these bougies is necessarily a somewhat slow process. In order to hasten the progress of the cure a number of instruments have been devised for the forcible dilatation of the stricture. As a rule, these are intended to be used mainly in connection with dilating bougies, as after the use of rapid dilatation the bougie is necessarily introduced in order to prevent the contraction of tissue which would ensue unless this were done. In Fig. 140 is shown Mackenzie's dilator, which consists of three blades bent at the proper laryngeal angle, and is operated by means of a screw at the proximal end. The instrument is introduced closed into the larynx, after which the blades are opened by turning a screw. The amount of distention accomplished is shown by an index and dial plate on the handle.

Navratil's dilator, shown in Fig. 141, is constructed on somewhat the same plan.

A syphilitic stricture of the larynx is composed of dense, resist-

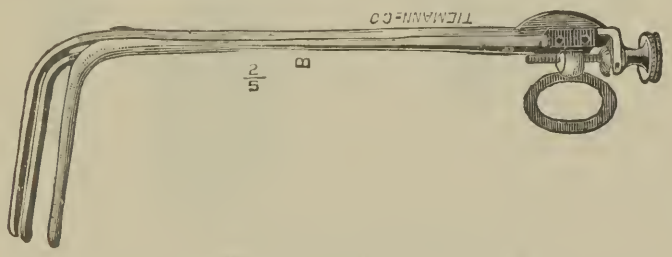

FIG. 140.—Mackenzie's Laryngeal Dilator, Open.

ing bands of connective tissue, which do not yield easily to dilatation; and in many cases undoubtedly Mackenzie's instrument, and probably also Navratil's, might prove somewhat too delicate in construction. The three-bladed dilator described by Schroetter, constructed on much the same principle as that of Mackenzie, only much heavier and stouter in every detail, is a valuable instrument in such cases. These instruments also are usually made use of after tracheotomy, although they do not involve the necessity of a tracheal opening.

Stoerck has devised a three-bladed dilator, which is inserted through the tracheal opening, for the divulsion of these strictures from below. I regard the manipulation through the mouth as much more feasible.

In those cases in which there is adhesion between either the true cords or the ventricular bands, or in which a web has formed across the glottis, some form of cutting instrument answers a better purpose, as a rule, than dilatation.

The use of a naked knife in the larynx requires rather nice manipulative skill. It is probably safer in these cases to make use of a concealed knife, such as Schroetter's or Mackenzie's instruments, in which the cutting blade is made to emerge from a tube after the instrument is inserted into the laryngeal cavity.

Whistler and Browne have devised instruments which consist of a combination of a cutting instrument with a dilator, and which possess the advantage of putting the tissues on the stretch before they are incised, thus rendering the cutting more thorough.

The use of cutting instruments may not only be resorted to in the

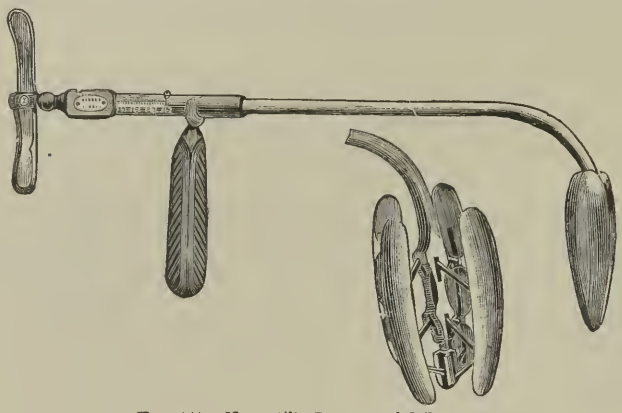

FIG. 141.—Navratil's Laryngeal Dilator.

cases of a web in the larynx, or adhesion of the cords, but they are valuable in all forms of laryngeal stricture in facilitating the process of dilating. After incisions, however, the use of dilators is necessary to secure what has thus been gained, as otherwise the cut surface would adhere and no practical benefit be derived by the operation.

It would seem that the simple measure of passing a catheter through the larynx, might be of service in the early stages of a syphilitic stenosis, and can be accomplished without a previous tracheotomy. In the later stages, however, the cicatricial bands are of such a dense and firmly resisting character that they yield only before metallic dilators or bougies. A metallic catheter might possibly be used in this way, but the indications would certainly be much more directly carried out by intubation.

Intubation certainly possesses the great advantage that it does not require tracheotomy, and that the treatment can be pursued while a sufficent patency of the air passages is maintained. O'Dwyer suggests that in those cases in which the stenosis is so great that a tube sufficiently large to admit of a proper amount of breathing-space

cannot be inserted, the patient be anæsthetized and the larynx forcilby dilated until a proper-sized tube can be inserted. The greatest difficulty lies in the fact that the larynx is so far distorted by the diseased action that the ordinary tube is not easily inserted, and even after it is *in situ* is not easily retained. In those cases in which this measure is available, I think there can be little question that intubation offers probably the best method of dealing with a syphilitic stenosis of the larynx.

Whatever measure is resorted to for overcoming the stricture, the contraction recurs, and these patients must be subjected to a periodical course of treatment to recover such ground as has been lost while remedial measures have been in abeyance.

CHAPTER LXXXVI.

TUBERCULOSIS OF THE LARYNX.

The development and course of tuberculous disease in the pharynx bears so close a relation to that of a similar process in the laryngeal tissues, and so many points in connection with the disease have been fully discussed in the former chapter, that, to avoid repetition, the reader is referred to what was said there for fuller information. We have there taken the ground that the development of a tuberculous process acquires an added virulence, and occurs with greater rarity, according as it locates itself in the parts nearer to the outer world. This view was emphasized by the fact that tuberculous disease of the pharynx is in the very large majority of, if not in all, cases, a manifestation of an acute miliary tuberculosis. As we approach nearer to the pulmonary tissues, the most favored site for tubercle development, and observe the process as it manifests itself in the larynx, we find it not only occurring more frequently than in the pharynx, but also assuming a less virulent character and taking on more of the features which characterize pulmonary phthisis, with the added symptoms which are dependent upon the locality and functions of the larynx.

Etiology.—Tuberculous disease manifests itself in the larynx under much the same general influences as those which govern its development in the pulmonary tissues. The direct cause of course is the lodgment or colonization of the tubercle bacillus, but there is also a "tuberculous diathesis," and by this we understand that peculiar systemic condition which, in a large majority of instances probably, if not all, is the result of heredity. Whether this condition consists in abnormally wide lymph channels, as suggested by Shakespeare, or some other systemic peculiarity, can only be a subject of speculation. The existence of this special diathesis we accept as a clinical fact.

In the very large majority of instances, a tuberculous process in the larynx succeeds or accompanies a similar process in the lungs. It has long been a mooted question whether a tuberculous process may occur primarily in the larynx. That the larynx may be invaded before any other portion of the air tract has been clearly demon-

strated in a case reported by Demme of a child aged four and a half years, dying of a tuberculous meningitis, in which the autopsy revealed tuberculous deposits in the larynx, while the pulmonary tissues were normal. The laryngoscope had already revealed the existence of tuberculous ulceration.

A primary deposit of tubercle in the larynx can undoubtedly occur without involvement of the lung tisues. A recognized tuberculous process in the larynx is not, therefore, to be regarded in every case as sufficient evidence of tuberculous disease in the lungs. As a matter of clinical observation, however, in the very large majority of instances in which the laryngeal disease develops, this occurs in the course of a chronic pulmonary disease. Furthermore, if, at the time the laryngeal affection is recognized, the lungs show no physical evidences of diseased action, the morbid process in the upper air tract is the strongest possible evidence that the pulmonary tissues are seriously threatened, and the development of diseased action there will very soon make itself known.

The disease occurs more frequently in adult life and between the ages of twenty and forty, and is also more common in males than in females.

From an extensive collation of cases we conclude that in all cases of pulmonary tuberculosis the larynx is involved in nearly one-third, and yet from a clinical point of view, I am disposed to think that statistics given by Willigk are more nearly correct, and that we may anticipate that about thirteen per cent of cases of pulmonary tuberculosis will develop an active disease of the larynx, viz., that form of tuberculosis which manifests itself by well-marked subjective symptoms, and which is characterized by progressive waste of tissue. The general pathology of this disease has been sufficiently described in a former chapter.

Its first manifestation in the larynx consists in a circumscribed deposit, usually in one side of the organ. The most frequent site for this primary invasion is in the membrane covering the arytenoid cartilage or commissure. Next to this, in order of frequency, are the mucous membrane covering the arytenoid cartilage, ary-epiglottic fold, the true cord, and lastly the epiglottis. After the primary invasion, the other portions of the larynx become involved, as a rule by lateral extension, or, in rare instances, by new centres of tuberculous infiltration. After the ulceration has been established in one side of the larynx, it is probable that it may be transferred to the opposite side by a process of auto-inoculation. Ariza has reported two instances of long pedunculated growths attached to the posterior wall of the larynx, which he regarded as tuberculous in character, on ac-

count of a co-existing pulmonary tuberculosis, although their histological structure was not definitely ascertained. The small wart-like excrescences which appear on the anterior face of the arytenoid commissure, and also occasionally in other portions of the larynx, in laryngeal phthisis, are conditions of common observation, and partake of the characters of ordinary papillary growths.

I cannot agree with Stoerk or Mandl in regarding these wart-like excrescences as possessing any diagnostic value in the early stages of tuberculosis, as they are not infrequently observed in a simple catarrhal inflammation of the organ.

Symptomatology.—Impairment of voice is one of the earliest evidences of the tuberculous invasion of the larynx, due in the majority of cases to an interference with the approximation of the cords.

In tuberculous disease, the impairment of voice manifests itself in its soft, weak, and somewhat aphonic character. This is especially true when the commissure of the arytenoids is so far infiltrated as to interfere with the approximation of the cords.

As the infiltration or ulceration invades the cords, the voice becomes more and more impaired.

In rare instances it remains unaffected up to a very late stage.

Symptoms referable to deglutition occur quite early in the course of the disease. If the arytenoids are the seat of the infiltration, there is a slight difficulty in swallowing, attended perhaps with a certain amount of uneasiness in the region during the act. This is due in part to the impingement of the epiglottis on the crest of the arytenoids, and in part to the pressure of the bolus of food.

When ulceration occurs, the pain becomes more severe and increases with the extent of the swelling and ulceration of the parts, becoming a source of acute suffering only when the epiglottis is involved.

Cough is almost invariably present, and, while usually due to the pulmonary disease, its severity and persistency are undoubtedly aggravated by the laryngeal affection. Especially is this true of the ulcerative stage, when the secretions accumulate in the larynx and prove an additional source of irritation on account of the difficulty which the patient experiences in dislodging and expelling them.

The larynx is somewhat sensitive to pressure, and the patient experiences considerable pain on movement of the organ. This symptom, however, is not so prominent in the early stage of the disease as it is after ulceration occurs.

The sense of fulness and distention in the parts is experienced very early in the history of the disease, and is due to the tumefaction of the tissues, which gives a sense of soreness and stiffness to the parts.

Free hemorrhage from the larynx is an exceedingly rare occurrence; I have never met with a single instance in which such an accident occurred.

If the infiltration extends to the perichondrium, a perichondritis is the result; this accident does not prominently complicate the disease, in that such a perichondritis presents none of the markedly painful symptoms which characterize an idiopathic attack of this affection. Necrosis of the cartilage necessarily follows such a complication. Instances of this involving the arytenoids have been reported. The necrosed cartilage may remain embedded in the tissues, or it may separate itself and be expectorated. The perichondritis, while not especially painful, may give rise to a notable amount of swelling and œdema of the mucous membrane covering it.

A moderate amount of œdema in laryngeal phthisis is by no means uncommon, yet instances are exceedingly rare in which it develops to such an extent as to constitute a grave complication.

When laryngeal dyspnœa becomes a prominent symptom, as happens in rare instances, I am disposed to think that its source is not to be found in the œdematous swelling so much as in a narrowing of the glottis from ankylosis of the crico-arytenoid articulation; when this takes place the fixation is very liable to occur with the cords in or near the median line, giving rise to a condition similar to that of bilateral paralysis of the abductor muscles.

The epiglottis being a fibro-cartilage, an extension of the tuberculous infiltration to this part results in an ordinary ulcerative process, rather than in necrosis.

Diagnosis.—Ordinarily, the subjective symptoms of laryngeal phthisis are so well marked, especially in those cases which supervene upon pulmonary disease, that a diagnosis can be made with a considerable degree of certainty. A laryngoscopic examination alone will reveal to us the extent of tissue involved, the definite character of the lesion, and the stage of the disease. The assertion has been made by Von Ziemssen that a tuberculous process in the larynx cannot be definitely recognized as such by ocular inspection in those cases in which the lungs are not also invaded. I think on the contrary, that tuberculous disease presents appearances so typical and characteristic that we should be able to recognize it as such with comparatively little hesitancy.

The primary effect of a tuberculous infiltration seems to be to cause, first, a certain amount of tumefaction of the part, and, secondly, an interference with circulation.

A laryngoscopic examination will show us in the mucous membrane of the larynx, usually in the arytenoid commissure, a swelling

which in the arytenoid causes what is known as club-shaped arytenoids. One side is sometimes more involved than the other, although in my own experience these masses invariably presented an almost symmetrical outline. If the ventricular bands are involved, the condition is usually unilateral. If the epiglottis is involved, the infiltration very early invades the crescentic edge, giving rise to what has been described as the turban-shaped epiglottis (see Fig. 142). Here, again, the tumefaction is usually symmetrical, although in the commencement of the invasion of this portion of the larynx I have seen a well-marked unilateral tumefaction. While, then, the circumscribed tumefaction, and in certain cases the unilateral distortion of the organ, should excite suspicion, especially in patients

FIG. 142.—Tuberculosis of the Larynx, with Infiltration of the Epiglottis, producing the so-called "Turban-shaped" Epiglottis.

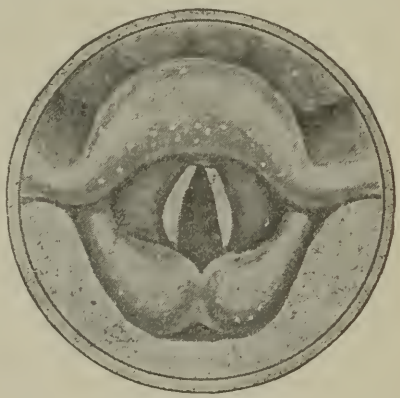

FIG. 143.—Tuberculosis of the Larynx. Numerous miliary tubercles are seen lying just beneath the epithelial layer of the mucous membrane.

suffering from pulmonary tuberculosis, the peculiar color which the disease presents in the first stage will go far toward eliminating any doubt as to the character of the lesion.

At the onset of the disease, the membrane presents a dull grayish-yellow tinge, somewhat solid and semi-opaque in appearance. At the end of a few days, or at the latest, perhaps, at the end of a week or two, the membrane becomes studded with minute yellowish points, which mark the development of tuberculous nodules in the more superficial layers of the mucosa proper and immediately beneath the epithelial layer. They give rise to no superficial elevation, but can be seen somewhat hazily, as it were, through the semi-transparent epithelium (see Fig. 143). They are of a grayish-yellow tinge, and of a distinctly lighter color than the mucous membrane surrounding them.

The further development of the morbid process in the larynx consists in the breaking down of these small tuberculous nodules, and the establishment thus of minute points of ulceration, the borders of which, by a slow process of extension, widen until they meet similar ulcerated points in neighboring parts, and thus eventually there is established an ulcerated surface covering a more or less wide area.

After the stage of ulceration has set in, the morbid process assumes quite a different aspect. The change which now occurs consists practically in the destruction, by exfoliation, of the epithelial surface, and the uncovering of the tuberculous process in the mucosa, which now gives rise to a certain amount of superficial waste. In color the ulcer is still a grayish-yellow, although it is occasionally dotted here and there with minute elevations of a somewhat pinkish color. The surface is ragged and worm-eaten, as it were (see Fig. 144). Fränkel likens it to the surface of cut bacon, while La Boulbene compares it to the track of earthworms in wet sand. To me, it has often suggested a dish of wet meal which birds have pecked at. The ulcerated tissue, as well as the infiltrated membrane surrounding it, is highly anæmic, and the color of the two portions is so closely alike that it is oftentimes not easy to detect where the unbroken mucous surface ends and the ulceration begins. The edge of the ulcer is irregular in outline, and its surface flush with the surrounding tissues. In other words, while there is superficial waste, there is an equal amount of progressive tuberculous infiltration, which fully compensates for the superficial waste. The loss of tissue therefore, is not apparent, in that the general contour of the parts is practically maintained. Occasionally, the central portions of an ulcer may be slightly depressed, perhaps, but this is not the rule.

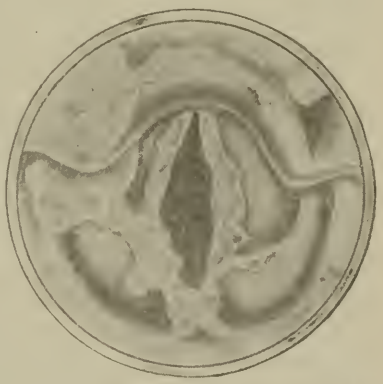

FIG. 144.—Extensive Tuberculous Ulceration of the Larynx.

The secretion from the surface of a tuberculous ulcer is a thick, tenacious, semi-opaque, ropy mucus, closely adherent and limited in amount. The secretion is grayish and semi-translucent, and contains few pus corpuscles.

Although, as a rule, there is no notable loss of tissue, yet when the fibro-cartilage of the epiglottis becomes the seat of a tuberculous ulceration, there is a somewhat slow but progressive destruction of

this organ. The same is true, and to a less noticeable extent, with reference to the vocal cords. The arytenoid cartilages, in rare instances, becomes necrosed and exfoliated, not as the result of tuberculous disease of the cartilage itself, but rather of the perichondrium. Even this, however, results in no very noticeable loss of tissue. The point which it is desired to emphasize in this connection is that the very extensive tuberculous infiltration of the mucous membrane, or the parts beneath, results in a thickening, which more than compensates for any superficial loss of tissue which is due to the ulcerative process on the surface.

As before stated, tuberculous disease presents appearances which should not easily be mistaken for any other form of diseased action, and yet the discussion is scarcely complete without emphasizing the distinctive points of difference between this disease and syphilis, lupus, perichondritis, and malignant affections.

In the superficial ulcer of syphilis, we have a distinctly yellow, purulent discharge, a slightly rounded excavation, surrounded by a reddened mucous membrane without swelling, in contradistinction to the tuberculous process in which the secretion is gray mucus with no excavation, and a mucous membrane surrounding it, which is absolutely bloodless and notably swollen. In the deep ulcer of syphilis, we have all the features of the superficial ulcer exaggerated, with the markedly injected areola surrounding it, and the profuse discharge not only of pus but of necrotic tissue. The possibility of the two processes occurring simultaneously in the same larynx is to be borne in mind. When this occurs, however, each disease seems to maintain its characteristic features.

In lupus, we have a highly injected condition of the mucous membrane, with nodular swellings, exceedingly limited secretion, together with a possible appearance of ulceration, which, however, it is almost impossible to definitely outline and distinguish.

Perichondritis may possibly be mistaken for a tuberculous infiltration. In the latter process, however, the distinctly exsanguinated appearance presents a marked contrast to the highly injected and semi-œdematous aspect of inflammation of the perichondrium.

In malignant disease, we have the unilateral tumor, with its irregular nodular outline, together with the highly injected mucous membrane covering it, and, when ulceration occurs, the more or less profuse secretion of an ill-smelling muco-pus, often charged with blood and necrotic tissue. Laryngeal stenosis, moreover, is characteristic of malignant disease, and rarely of tuberculosis. We have already asserted that the characteristic feature of vocal impairment in laryngeal phthisis is a weakness of the voice. The laryngoscopic

examination will reveal, as the source of this weakness, either an ulceration involving the vocal bands themselves, or, what is a more efficient cause, an impairment in adduction, the result of an infiltration of the arytenoid commissure. This impairment of motion of the cords may also arise from an involvement of the crico-arytenoid articulation, giving rise to defective mobility, or even a complete ankylosis. This condition may occur either in one or both sides of the larynx. It is a curious clinical fact that when an ankylosis of this joint develops, the fixation is more liable to occur with the cord in the median line than in abduction. The examination of the larynx, therefore, will reveal an apparent paralysis of abduction, either one or both vocal cords lying in the median line, or possibly in the cadaveric position. The real lesion in these cases is to be regarded as an ankylosis of the crico-arytenoid articulation. A laryngeal paralysis in a tuberculous patient is to be regarded as of grave import.

Prognosis.—When tuberculous laryngitis supervenes upon an attack of pulmonary disease, it is to be regarded as an exceedingly serious complication. When the disease develops primarily in the larynx, or simultaneously with a pulmonary invasion, it is to be regarded as evidence that the tuberculous infection is characterized by unusual virulence and activity.

The average duration of life after the onset of pulmonary phthisis is generally stated at about three years.

From cases reported and from those in my own experience I conclude that the average duration of life in pulmonary phthisis is three years; the average duration of life in pulmonary phthisis complicated by laryngeal disease is two years; the average duration of life after the supervention of laryngeal complications is eighteen months.

In individual cases, of course, the prognosis of laryngeal disease is markedly influenced by special circumstances, the most important of these being the progress of the pulmonary disease if such exists. If the lungs are in an advanced state of phthisis, the laryngeal disease runs a more rapid course and leads to an earlier fatal issue; if the pulmonary disease is in its earlier stages, and does not advance rapidly, the laryngeal disorder may run an exceedingly chronic course. If the epiglottis is involved, the subjective symptoms become of an exceedingly painful character, while at the same time the progress of the disease seems to be accelerated and ulceration sets in quite early. In a less degree the same is true when the mucous membrane covering the arytenoid cartilages and commissure is involved. If the ventricular bands, on the other hand, are attacked, we not infrequently find that the local lesion develops rather slowly.

From a practical point of view, of course, the more important consideration has to do with the prognosis of this affection, as regards treatment. Unquestionably, in the very large majority of cases, all measures of treatment fail to arrest the disease, and a fatal termination ensues sooner or later. We are justified, I think, in confining ourselves, in the discussion of prognosis, to the laryngeal manifestation, and may fairly claim a cure if the tuberculous process in the larynx is arrested, although the patient subsequently dies of the pulmonary disease. If our remedial efforts succeed in arresting the local lesion in the larynx, we are undoubtedly not only prolonging life but relieving our patient from a grave complication of the pulmonary disease, which is the source of an amount of suffering and distress exceeded in but very few diseases which we encounter. In this view of the case, I am disposed to think that the prognosis is not so unfavorable as is claimed by most observers; and whereas undoubtedly a majority of cases resist all remedial efforts, in a certain proportion of instances, by a carefully carried out and judicious course of general and local measures of treatment, we may entertain a reasonable hope of arresting the morbid process, especially if treatment is begun in the first stage of the affection.

In no ulcerative process, probably, are we able to detect in a less degree any reparatory effort on the part of nature than in tuberculous ulceration, and yet instances of spontaneous cicatrization have been reported.

Treatment.—We have already, in the chapter on tuberculosis of the pharynx, discussed somewhat at length the mild plan of treatment, which in my own hands has been found most efficacious in the relief of tuberculous disease. This consists, first, in the thorough cleansing of the parts; second, the use of a mild astringent; third, the topical application of morphine, either in powder or solution; and fourth, in the stage of ulceration, the insufflation of iodoform.

For the details of this method of treatment, the reader is referred to the former chapter. It is of the utmost importance that these applications should be carried out in such a manner as will in the least degree irritate the diseased part. For the larynx, the solution should be applied by means of the atomizer, and here the ordinary Sass spray tubes, worked with the compressed-air apparatus, are of special efficacy: the tongue being well protruded, and the beak of the spray tube being passed into the fauces until it projects over the epiglottis, the sudden letting on of the pressure floods the cavity with a finely atomized fluid in such a way that the whole of the diseased surface is thoroughly bathed in the medicated solution before the parts can contract in such a manner as to shut off the cavity. In

the absence of the compressed air, the hand-ball atomizer, deftly used, can be made to accomplish an excellent purpose.

The iodoform is best applied by means of Ely's powder-blower with a properly curved laryngeal tip. By this instrument, the powder is distributed equably over the diseased surface in such a way as to cause the least irritation.

Occasionally in the ulcerative stage a more permanent effect of the morphine will be obtained by combining it with the iodoform and a mild astringent, as in the following formula:

℞ Morphinæ, ...	gr. x.
Acidi tannici, ...	ʒ ij.
Iodoformi, ...	ʒ vi.
M.	

It is to be borne in mind always, in using morphine, that its constitutional effect is promptly felt when applied to the mucous membrane of the air tract; hence, care should be exercised in using certainly no more than the officinal dose. This plan of treatment is to be carried out two or three times weekly, or even daily, according to the relief given and the observed effect on the morbid process.

In the stage of infiltration, I have rarely seen instances in which the subjective symptoms were not very notably relieved by this plan of treatment, and in most instances the local morbid process seemed to be notably retarded, as evidenced by the laryngoscopic appearances.

With the development of an ulcerative process, of course, we have to deal with a much graver lesion; and yet in this stage of the disease I have seen a number of cases in which, by the daily resort to the above plan of treatment, cicatrization resulted; and although these patients ultimately died of pulmonary phthisis, the success of local measures in arresting the laryngeal complication was clearly illustrated. It should be stated, however, that in these successful cases the ulcerative process was confined to the ventricular bands, the vocal cords, or the commissure; in no case have I seen more than temporary relief afforded in a case of laryngeal tuberculosis in which the epiglottis was involved. The iodoform, of course, is inert in the first stage, but in the ulcerative stage I am disposed to think that this drug is the important agent. Europhen, which is practically odorless, apparently possesses the same action as iodoform.

In my experience I have failed to discover that cocaine possesses any valuable curative properties either in the stage of infiltration or of ulceration. It is of incalculable value, however, in those cases in

which deglutition is painful, in that the temporary anæsthesia which is secured by its use enables the patient to take food and drink with ease and comfort, when otherwise this act would be attended with distressing pain. For this purpose I have been in the habit of suspending the cocaine in an oily menstruum, as follows:

℞ Cocainæ hydrochloratis, ... gr. xx. to xxx.
Aquæ, ... ʒ ss.
Ft. sol. et adde
Ol. petrolati, ... ad ℥ i.
M.

This is to be inhaled by the patient as needed, from the Burgess atomizer.

Of the inhalation of medicated solutions, by means of the steam atomizer, or dry inhalations of the gum resins, etc., I have already expressed my disapprobation in the chapter on "Tuberculosis of the Fauces." In the same place the excellent results obtained by Heryng and Krause, from the use of lactic acid, with or without scarification, have been discussed, as also the menthol treatment of Rosenberg and Schmidt's scarifications. In making applications of lactic acid to the larynx, the drug is carried down to the parts by means of a pledget of cotton on a probe, the manipulation being of course directed by the laryngeal mirror *in situ*. In view of the excellent results which have followed the lactic-acid treatment, I do not think we have done our full duty in any given case without fully testing its efficacy. In connection with it, however, the mild course of treatment before outlined should be carried out at the same time, since there is nothing in the one plan which in the least degree conflicts with the other.

In many cases, as the result of the extensive infiltration, or on account of a complicating œdema, the stenosis becomes so great as to demand tracheotomy. The propriety of this operation to relieve dyspnœa is of course beyond question. The temporary relief to the local symptoms, which in many cases seems to have followed opening the windpipe, has suggested the question whether tracheotomy might not be performed as a direct remedial measure in those cases in which no stenosis exists.

From the results reported I conclude that, while the operation is not one to be generally recommended, we are not justified in condemning it in all cases, for in those instances in which the localized pain becomes extreme in character, and the difficulty and distress in swallowing become so great as seriously to interfere with the taking of food, if the patient's general condition is such as to warrant the

operation, I think we may fully anticipate that the absolute rest which tracheotomy affords to the laryngeal movements will serve to markedly alleviate the local pain and enable the patient to take food with much more comfort and ease.

Schroetter very properly suggests that if the air passages are opened, the lower operation should be performed. If the trachea is opened to relieve dyspnœa, the operation should be done promptly, and without waiting until the stenosis becomes extreme.

E. Fränkel, in reporting his case of primary tuberculosis of the larynx, suggests the question of the advisability of an extirpation of the organ. In the absence of a certainty that the laryngeal invasion is primary I do not think the suggestion could be seriously entertained.

Koch's lymph as a cure for the tuberculous process has not given the results hoped for it at the time of its introduction. Neither have the cantharidate of potassium, the chloride of gold and sodium, and the iodide of manganese, nor the rectal injection of sulphuretted hydrogen been proved to possess any great efficacy.

The indications for general treatment in a case of laryngeal disease are practically the same as for pulmonary phthisis, and need not be entered upon here. Of course no one will undertake the management of a case of laryngeal phthisis without availing himself of the beneficial effects which can be obtained from cod-liver oil, iron, general tonics, creasote, opiates, and other remedies whose action is to control the various distressing symptoms of the disease. Especial emphasis should be given, I think, to the great value of creasote in these cases. I have seen the best results from doses which commence with one grain and increase to two or three grains, given three times daily. The same may be said of the enforcement of certain hygienic rules, such as the use of the bath, the regulation of the clothing, the proper ventilation of the living and sleeping apartments, etc., and a change of climate when possible.

One of the greatest difficulties with which we have to contend in these cases is the administration of a proper amount of food, on account of the pain with which deglutition is frequently attended. The great value of cocaine in producing temporary anæsthesia has already been referred to. An ingenious suggestion has been made by Wolfenden, who reports that one of his patients, in whom deglutition was unusually painful, found that he could take fluids with considerable ease by stretching himself prone upon his stomach, with the head lower than the feet, and sucking them through a tube. I have seen this method tried with great success. Of course, when necessary, the œsophageal tube can also be resorted to. Delavan has de-

vised a special apparatus for alimentation in this disease, which consists of a flexible catheter attached to a pumping apparatus, by which the food is forced into the stomach. The end is equally well accomplished by the ordinary nasal douche or fountain syringe, with a catheter attached.

CHAPTER LXXXVII.

LUPUS OF THE LARYNX.

The development and clinical history of lupus in the upper air tract has already been so fully discussed in the chapter on lupus of the fauces that in the present consideration we confine ourselves to those features of the disease which have an especial bearing on the laryngeal invasion.

Etiology.—As already stated, the large majority of cases of lupus in the air tract develop secondarily to cutaneous lupus. After the fauces are invaded, the progress of the disease is usually from above downward, progressively involving the pharynx and larynx.

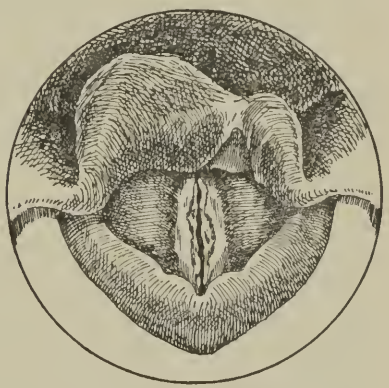

Fig. 145.—Lupus of the Larynx (author's case).

The primary invasion of the larynx is by no means such a rare occurrence as has been supposed, cases of primary laryngeal lupus having been reported by many observers. A single instance of this, also, has come under my own observation: that of a young man, aged twenty-eight, in whom the disease at the end of three and a half years had destroyed about two-thirds of the epiglottis and had infiltrated the ary-epiglottic fold and commissure (see Fig. 145). He suffered no special discomfort from the disease, other than in the vocal impairment. There was no involvement either of the skin or other portions of the air tract.

Symptomatology.—The invasion of the larynx involves symptoms mainly referable to the voice and respiration. Pain in deglutition may occasionally be present. The voice is impaired according as the disease invades the ventricular bands, the commissure, or the true cords. The encroachment upon the breathing-space, giving rise to dyspnœa, is usually the most serious symptom which occurs, and it may even result in death from suffocation. A laryngeal stenosis seems also to have been a prominent symptom in some cases. In the

majority of instances, however, the disease expends itself in a slow but surely progressive destruction of tissue, rather than in tumefaction with encroachment upon the breathing-space. When stenosis occurs, it is dependent upon the infiltration of tissue only.

Diagnosis.—The recognition of the disease is based on the same general rules as those already given in the discussion of the faucial disease. It usually attacks primarily the epiglottis, and slowly extends downward to the ary-epiglottic folds and ventricular bands, producing thickening of tissue, distortion of contour, and impairment of function.

Prognosis.—Lupus of the larynx is characterized by the same chronicity which attends a similar process in the parts above, and practically the prognosis is the same, except so far as it involves the danger of laryngeal stenosis and death from suffocation. Regarding this latter as a danger easily averted by tracheotomy, the disease is not one which involves any great danger to life.

Treatment.—The general indications for treatment have already been sufficiently discussed in the previous chapter on "Lupus of the Fauces." As regards the laryngeal disease, nothing further need be said, other than the suggestion that when dyspnœa becomes in any way a prominent symptom a tracheal tube should be inserted without unnecessary delay.

A laryngeal stricture as the result of lupus would seem to constitute a form of stenosis particularly favorable for the use of dilating bougies, in that the tissue is tolerant, and, if observed before extensive cicatrization has occurred, not very dense or resisting. A case of Ganghofner was treated by the solid stick of nitrate of silver and the galvano-cautery, and at the same time subjected to a systematic course of dilatation by Schroetter's bougies. He regards the stenosis as having been thoroughly overcome at the end of two months.

CHAPTER LXXXVIII.

NEUROSES OF THE LARYNX.

In the consideration of laryngeal neuroses we are confronted at the outset with no little difficulty in deciding upon a definite classification. We shall therefore simply group our neuroses according to the clinical manifestations, as follows:

Hyperæsthesia.

Undue sensibility of the larynx occurs in connection with acute laryngitis and other inflammatory affections of the organ, and thus frequently in connection with chronic catarrhal processes. It is an especially prominent feature of laryngeal phthisis and in some cases of carcinoma. In syphilis, on the other hand, the sensibility is usually diminished. It also occurs in connection with chronic catarrhal pharyngitis, and is especially common in the pharyngitis which results from the intemperate use of alcohol. The reflex sensibility of the larynx varies notably in different individuals, and a certain amount of hyperæsthesia may occur in individuals of a peculiarly nervous temperament. In the very large majority of instances, however, it is purely symptomatic, and possesses no points of special clinical interest as an independent affection.

Anæsthesia.

Complete abolition of sensation in the larynx can be due only to some involvement of the superior laryngeal nerve, although diminished sensibility is not infrequently met with in chronic inflammatory processes of long standing. It also occurs in syphilis, and may be one of the sequelæ of diphtheria. The tolerance of instrumentation in hysterical females in well known. It may also be present in the general paralysis of the insane, in cases of tumor at the base of the brain, the early stages of tabes dorsalis, and other affections of the medulla.

Paræsthesia.

By this term we designate certain perverted sensations, such as tickling, irritation, a constant desire to swallow, or the feeling as of a foreign body impinging upon the parts. Undoubtedly, in the large proportion of these cases a careful investigation will reveal some organic lesion to account for the symptoms, such as an hypertrophied lingual tonsil, enlarged pharyngeal glands, a morbid condition of the naso-pharynx, cheesy matter in the faucial tonsil, etc. We constantly meet with cases in which a tickling, or sense of irritation, producing cough, is referred directly to the larynx, whereas the real source of the trouble lies in the passages above. Patients suffering from impairment of the general health from anæmia or phthisis are especially liable to these perverted sensations, as well as individuals of nervous temperament. In many instances they are purely imaginary, while in others they are dependent upon some slight morbid lesion in the larynx or other portion of the air tract.

Neuralgia.

While pain referable to the region of the larynx is by no means an uncommon symptom, in most instances it can be traced directly to some morbid lesion of an organic character, either in the larynx itself or in the adjacent passages. It may also be due to anæmia, rheumatism or gout, phthisis, and carcinoma. In a case under my care the source of the difficulty seemed to be an attack of acute naso-pharyngitis. The prominent neuralgic symptoms were explained by the fact that the patient was of an intensely nervous habit. He was completely relieved by the administration of aconitia, one five-hundredth of a grain every two hours, until the characteristic symptom of tingling in the fauces was produced. In this case the laryngeal pain seemed to have been purely neuralgic in character, being paroxysmal.

The prominent indication for treatment of neuralgia of the larynx, as well as of hyperæsthesia and paræsthesia, consists in the removal of such contributing causes as can be discovered in any portion of the air tract.

Paralysis of the Superior Laryngeal Nerve.

This nerve supplies sensory innervation to the mucous membrane lining the larynx, and motor innervation solely to the crico-thyroid muscle, and in part to the arytenoideus. Complete superior laryngeal paralysis, therefore, would result in an abolition of sensation of

the mucous membrane of the laryngeal cavity, while at the same time the tension of the cords and the approximation of the arytenoid cartilages would be seriously impaired.

The disease may involve either one or both sides of the larynx. In the latter instance it produces paralysis of the tensor muscles of the larynx as well as of the arytenoideus, together with impaired sensation. When the affection is unilateral, however, the arytenoideus paralysis is usually not apparent.

The diagnosis will depend upon a careful analysis of the laryngeal movements as seen by the laryngoscopic mirror, together with a testing of the sensation of the parts by the introduction of a probe.

I know of no lesion which will produce the curious glottis which

FIG. 146.—Bilateral Paralysis of the Superior Laryngeal Nerve.

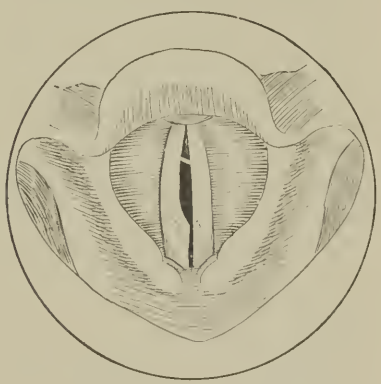

FIG. 147.—Unilateral Paralysis of the Superior Laryngeal Nerve.

is observed when both the superior laryngeal nerves are paralyzed, viz., that in which the chink is divided by the approximation of the tips of the vocal processes. If the paralysis is unilateral, the laryngoscopic image simply shows a relaxed condition of that portion of one of the vocal cords which extends from the vocal process to the thyroid cartilage. This condition might be the result of paralysis of the crico-thyroid muscle. The impairment or absence of sensation in the lining membrane of the larynx in such a case should indicate, however, a lesion of the superior laryngeal nerve.

These cases generally recover; the duration of the affection, however, is dependent on its exciting cause. If it follows diphtheria we may anticipate complete recovery at the end of from one to two months. In a case of section of the nerve, complete restoration of voice does not seem to have occurred until the end of about twelve months.

The treatment of the affection consists in the administration of

general tonics, strychnia, friction, massage, and local faradization, with such general hygienic measures as may seem to be indicated.

Recurrent Laryngeal Paralysis.

This nerve supplies motor innervation to all the muscles of the larynx except the crico-thyroid. As the result of its paralysis, therefore, we have practically a complete abolition of motion on the side of the larynx involved; for although, as we know, the contractility of the crico-thyroid muscle is still preserved, yet, when all the other muscles of the larynx are paralyzed on that side, it is practically impossible for the crico-thyroid to exert any appreciable influence.

Etiology.—In the very large majority of cases which come under our observation, this affection is due to pressure exerted upon the nerve trunk in some portion of its course. On the left side, passing, as it does, around the arch of the aorta, it seems to be exceedingly liable to become involved in aneurismal dilatations of this vessel. Our first suspicion always, in discovering a left recurrent paralysis, especially in a patient in the later years of life, is that it may be due to aneurism. While this latter affection not infrequently gives rise to it, it is probably a mistake to regard it as the most frequent cause.

We find that this form of paralysis may occur as the result of central lesion, lesion of the trunk of the nerve, or from peripheral causes.

In a number of reported cases in which the paralysis was due to a central lesion, and in which post-mortem examinations were made, extensive destruction of the medulla was found, involving the pyramids, the olivary bodies, the restiform bodies, and the floor of the fourth ventricle. The central lesion may be either hemorrhage, embolism, endarteritis, disseminated sclerosis, or the ascending sclerosis of locomotor ataxia. In most instances, probably, this latter form of disease gives rise to abductor paralysis of one or both sides, and yet cases of right recurrent laryngeal paralysis occurring in connection with locomotor ataxia have been reported, as well as cases in which the paralysis was on the left side.

That form of paralysis which is due to lesion of the nerve trunk is probably the most frequent of all, and occurs in the majority of instances on the left side. It is the result of pressure from aneurism, enlarged lymphatic glands, or other neoplastic development in the course of the nerve, such as mediastinal tumors, cancer of the œsophagus, etc.

The pleuritic adhesions which develop in incipient phthisis may give rise to pressure on the nerve, causing paralysis. This usually

occurs on the right side, the pleura extending somewhat higher on this side than the left. Instances are on record in which the paralysis was the result of a serous effusion in the pleural and pericardial cavities, and which promptly disappeared on the resorption of the serum. In the reported cases of this form of paralysis which followed diphtheria, typhoid fever, and other of the exanthemata, the lesion, as in other forms of paralysis following these affections, was primary and the result of the blood poison, exciting a neuritis and involving the nerve centres, the nerve trunk, or the terminal filaments. The local inflammatory process, however, exercises an undoubted influence. In two of my own cases there was an ephemeral paralysis of the recurrent nerve, occurring in acute naso-pharyngitis accompanied by laryngitis. We can only suggest in regard to these that the terminal filaments of the nerve were involved in the local morbid process. As a rule, a double recurrent paralysis will be accepted as evidence of central lesion, although it may occur, of course, from coincident pressure on both nerve trunks. Cases are reported in which pressure upon the pneumogastric nerve of one side has given rise to bilateral paralysis of the recurrent nerve. It is quite possible in these cases that the pressure on the pneumogastric sets up organic changes of the nerve centre, and that in this way the double paralysis really resulted from a central lesion.

Pathology.—The degenerative changes which take place in the nerve as the result of paralysis are simply those which occur from a permanent interruption of the nerve current, either from pressure on the trunk or destruction of the centre. These degenerative changes also extend to the muscular structures which are supplied by the nerve, which undergo atrophy simply from their inactivity.

Symptomatology.—If the paralysis is unilateral, its onset is marked by a notable degree of impairment of the voice, which becomes weakened rather than hoarse. The cord of the paralyzed side lying in the cadaveric position, increased effort is demanded on the part of the muscles of the opposite side to bring the vocal cord into position for phonation. Hence, the mere effort at talking becomes exceedingly wearisome. After a few weeks, however, the cord of the opposite side is finally so trained, as it were, that it can be brought around into apposition with its paralyzed fellow, in such a way that ordinary conversation is carried on with ease. The cord of the paralyzed side, however, is somewhat relaxed; hence, prolonged conversation becomes something of an effort, while the range of voice is necessarily impaired. As a rule, after a unilateral recurrent laryngeal paralysis has existed for some months, it is impossible to detect in ordinary conversation any symptom which would call attention to

an impairment of laryngeal innervation. If, on the other hand, the paralysis is bilateral, the voice is completely lost. The cords remaining widely separated in the larynx, the setting up of vibrations becomes an impossibility. The patient talks in a labored whisper, and, as the air escapes so rapidly through the glottis, the patient is compelled to stop and recover his breath at the end of every two or three words.

Any other symptoms which attend this form of paralysis, whether unilateral or bilateral, such as dyspnœa, cough, etc., must be attributed to other conditions than the simple laryngeal paralysis, this latter really being, as we see in the very large majority of instances, merely a symptom of some other more serious affection.

Fig. 148.—Cadaveric Position of the Cords, as in Bilateral Paralysis of the Recurrent Laryngeal Nerve.

Diagnosis. — The existence of this form of paralysis is easily recognized on laryngoscopic examination. If both sides of the larynx are affected, the cords are seen lying motionless in a position midway between adduction and extreme abduction; in other words, in the cadaveric position (see Fig. 148). The only affection with which it can be confounded is a bilateral paralysis of the adductors, in which both cords are observed widely separated and burying themselves, as it were, in the lateral walls of the larynx. The difference in the laryngeal images lies mainly in the fact that in adductor paralysis the cords are not only more widely separated, but the vocal processes are swung outward in such a way as to produce a somewhat concave appearance of the vocal cords, while in the cadaveric position the vocal process is seen slightly projecting in the direct line between the arytenoid and the receding angle of the thyroid. If the paralysis is unilateral, the vocal cord of the affected side will be seen lying in the cadaveric position, while that of the healthy side will be found moving not only throughout its normal arc, but in adduction passing beyond the median line and swinging over to meet its fellow, for purposes of phonation. In this act the arytenoid cartilage of the healthy side passes slightly in front of the opposite cartilage, as seen in Fig. 149.

The diagnosis will depend, then, on this peculiar position of the two arytenoids during phonation with reference one to the other, and

the obliquity of the rima glottidis, which is deflected from before backward toward the paralyzed side. This is easily seen if the laryngeal mirror be so arranged in the fauces that the centre of the crest of the epiglottis is brought in a directly straight line with the centre of the arytenoid commissure during inspiration. If, now, the patient be directed to phonate, the narrowed chink of the glottis will be seen in an oblique line, while at the same time the cord of the paralyzed side will be observed to lie motionless in the cadaveric position. It is to be borne in mind always, in making this examination, that not infrequently we meet with an epiglottis standing so ob-

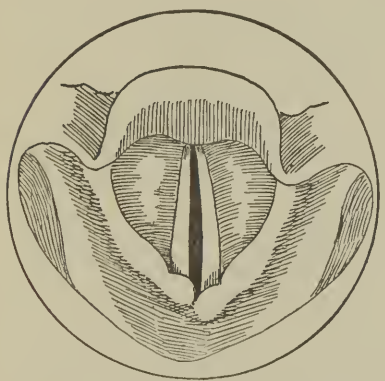

FIG. 149.—Right Recurrent Paralysis during Phonation.

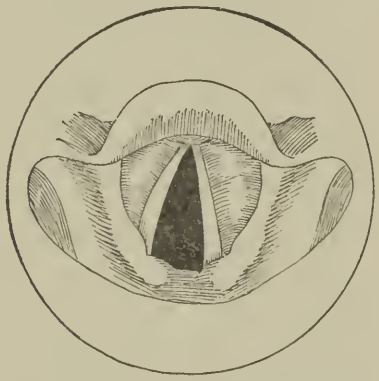

FIG. 150.—Right Recurrent Paralysis during Inspiration.

liquely that the centre of its crest will deviate several degrees from the median line. Curiously enough, if we align the laryngeal mirror with an oblique epiglottis, we will get an exceedingly deceptive laryngoscopic image, and one which will oftentimes give the appearance of recurrent paralysis. In such a case we adjust our mirror in the median line of the fauces by the eye, aligning it upon the soft palate and pharynx.

Having discovered a laryngeal paralysis, we must endeavor to ascertain its cause. This will involve a most careful inspection and examination of the thoracic organs by means of auscultation and percussion, of the cervical region by palpation and inspection, and of the nervous system by close questioning and other tests.

PROGNOSIS.—If the disease is the result of peripheral neuritis, as in diphtheria, one of the exanthems, or an attack of acute inflammation, recovery from the paralysis may be anticipated in the course of from three to six weeks. If, on the other hand, it is due to pressure on the nerve trunk or to a central lesion, the laryngeal paralysis is to be regarded merely as symptomatic of the affection which has

given rise to it, and the prognosis will be decided entirely upon the features of the more serious affection. If the condition which has caused the paralysis be a curable one, the prognosis as regards restoration of motility in the larynx will depend entirely upon the duration of the laryngeal symptoms. After a paralysis has existed for twelve months or even longer, the conductivity of the nerve may in rare instances be restored; but the muscles which this nerve has supplied undergo atrophic changes, which at the end of from six to nine months usually have reached such a stage that the hope of their restoration becomes somewhat doubtful.

Treatment.—If the disease is the result of an ordinary inflammatory process of the upper air passages, this should be actively attacked by topical applications of an astringent character. If it is caused by diphtheria or one of the exanthems, it should be treated by the internal administration of general tonics and strychnine. When it is due to disease of the nerve trunk or centre, the indications for treatment will depend entirely upon the ascertained cause of the paralysis.

When the paralysis is the result of an aneurism or other incurable affection, it is idle to hope for any beneficial effect from electricity. When, however, there is any promise of relieving the pressure on the nerve trunk by the removal or dissipation of the offending tumor, electrical stimulation should be followed up systematically until this is accomplished, in the hope of maintaining the muscular structures in a healthy condition. This may be done by applying one pole of the battery to the nape of the neck, and passing the other over the laryngeal region in front, or, better still, into the laryngeal cavity, and as far as possible stimulating successively the various paralyzed muscles. This is accomplished with comparative ease with the aid of cocaine anæsthesia. The faradic current usually answers the better purpose. If, however, the continued current shows a better reaction, as it occasionally does, this should be substituted.

Cases of recurrent paralysis will rarely be benefited by electrical stimulation. This agent so often irritates and inflames the parts and exhausts the patient, that it should never be used unless there is a very fair promise that it will be of decided benefit.

Bilateral Paralysis of the Abductor Muscles.

The muscular movements by which the opening of the glottis is accomplished during inspiration constitute what is called the respiratory function of the larynx, and depends solely upon the action of the posterior crico-arytenoid muscles. This function, as we know, con-

sists in the separation of the vocal cords during the act of inspiration, and is presided over by distinct nerve centres in the medulla. This form of paralysis, as involving both sides of the larynx simultaneously, occurs in such a large class of cases that it merits consideration as an affection distinct from the unilateral form of the disease.

Etiology.—There are three views advanced to account for this curious disease:

First.—That it is due to a peripheral lesion.

Second.—That it is due to a morbid lesion in the continuity of the nerve; and

Third.—That it is due to a central lesion.

First.—As regards the peripheral lesion: Mackenzie suggests that owing to the exposed situation of the abductor muscles on the posterior aspect of the larynx, they are especially liable to become the seat of injury, which, added to the fact of their ceaseless activity, renders them vulnerable; and he thinks that this fact may act in a causative relation to the disease, apparently abandoning the idea that the disease may be of cerebral origin. Gowers points out the fact that the abductor muscles are inserted into the arytenoid cartilages at an acute angle, while in the adductors this insertion is at a right angle. Hence, pressure affecting the nerve trunk results in a paralysis first of the abductors and subsequently of the adductor muscles.

Krause seems to have reached the conclusion that the disease is caused by a spasmodic contraction in the laryngeal muscles. This spasm, furthermore, he states, may result from a morbid condition of the nerve centres, or it may be dependent upon a reflex irritation of the superior laryngeal nerve, or a direct irritation of the recurrent nerve. He attributes the median position of the cords in pressure on the nerve to the spasmodic action of the other muscles in the larynx. The pressure on the nerve, not serving to arrest the nerve current, merely causes an irritation, under which spasmodic contraction follows in the muscles which it supplies. Some believe that confirmatory evidence of the spasmodic character of the disease lies in the fact that the voice is not affected. That this spasmodic element has any bearing on those instances in which the disease has persisted for long periods of time I do not believe, for it is difficult to understand how a tonic spasm affecting a given group of muscles can persist, through a long period of years even, without resulting in degenerative changes which are to an extent uniform in all, for repeated investigations have demonstrated conclusively that the abductor muscles are the ones which alone undergo marked atrophic degeneration.

Second.—As to a morbid condition of the continuity of the nerve as a cause of the disease. Pressure on the recurrent laryngeal nerve,

or other morbid conditions which may interrupt the nerve current, has been a favorite theory by which the phenomena of abductor paralysis is explained.

Semon deduces the inference from a series of experiments that when the nerve current which supplies all the laryngeal muscles is hampered or interrupted by pressure exerted in the course of the nerve, the fibres which supply the abductor muscles succumb first. In other words, the abductor muscles in this respect are somewhat weaker than the other muscles of the larynx, and thus yield to the influence of a defective innervation, while the stronger muscles maintain their contractility.

Though experimentation has demonstrated that under electrical stimulation the adductor fibres show a greater vitality than the abductors, yet I fail to see that this proves the proclivity theory of Semon.

We might expect that there would exist a difference in the response to electrical stimulation on the part of the phonatory and respiratory muscles of the larnyx. The respiratory movements of the larynx are unceasing, commencing with the first breath of life and ending only with dissolution. The phonatory movements of the larynx, on the other hand, are intermittent. The respiratory movements are involuntary, the phonatory movements voluntary. These functions, therefore, necessarily involve certain differences in innervation. I believe that the view that the disease is due to pressure on the recurrent nerve, and that this pressure so far discriminates between the nerve fibres as to destroy the conductivity of those fibres alone which are distributed to the abductor muscles, is quite untenable.

Third.—As to a morbid condition of the nerve centres.

I still hold to my opinion, expressed as follows in a former article upon the subject: "Reasoning from analogy, considering the peculiar character of the respiratory movements of the larynx in that they are purely involuntary and also reflex, that the opening of the glottis constituting the respiratory movement is an independent action separate from all the other movements which take place in the larynx as the result of muscular contractions, it is fair to conclude that this function is presided over by an independent ganglionic nerve centre, and that the disease in question consists in some degenerative change taking place in this portion of the nerve centres."

This view is substantiated by the clinical history of locomotor ataxia or tabes dorsalis, showing that laryngeal crises, anæsthesia of the lining membrane of the larynx, loss of reflex irritability, and symptoms of paralysis of the abductor muscles are a frequent accompaniment of the disease.

In a very large proportion of the cases in which the paralysis involves both sides we should certainly suspect the existence of some morbid process in the bulbar region, the laryngeal paralysis being accepted as evidence of this. That the disease may occur as the result of pressure on both recurrent nerves must be conceded, in view of the cases reported by Semon and others; but even in these I think it is probable that, if a careful investigation of the bulbar region were obtainable, some morbid process would be discovered.

Pathology.—The various changes which occur in the nerve centres and in the continuity of the nerve have already been clearly indicated. Perhaps the most interesting feature of the disease lies in the fact that the abductor muscles themselves undergo degenerative changes with atrophy, purely as the result of the interrupted nerve current. These changes are especially noticeable after the paralysis has persisted for a number of months, and are completed in from six to eight months.

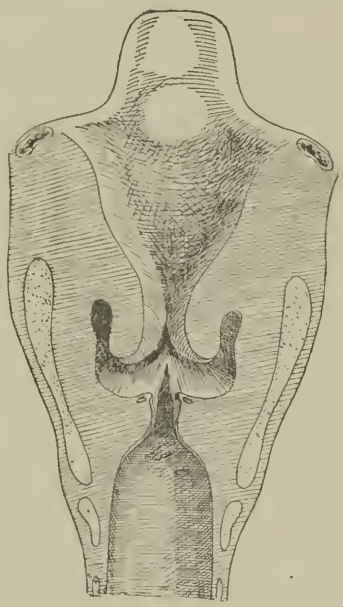

Fig. 151.—Transverse Section of the Larynx, illustrating the Valve-like Action of the Cords in Bilateral Paralysis of the Abductors.

Symptomatology.—The prominent feature of the affection consists in a gradually progressive development of inspiratory-dyspnœa, which soon assumes a somewhat spasmodic character. These attacks of inspiratory dyspnœa, which at the onset of the affection are somewhat mild in character, gradually assume a more serious form, and, in addition to this, they recur with greater frequency. The inspiratory character of the attacks is well marked from the first, and, as the paroxysms assume a more aggravated type, the act of inspiration becomes not only noisybut exceedingly labored. These paroxysms of dyspnœa are finally precipitated by any slight excitement or effort, and may come on a number of times during the day. Expiration is in no way affected, and there is, moreover, nothing in the voice which would call attention to the fact that the source of the disease was in the laryngeal cavity.

There are certain features in the gross anatomy of the larynx which I think in part explain the dyspnœic attacks. A transverse section of the larynx will show that the upper surfaces of the vocal cords

and adjacent tissues are hollowed in such a manner that they present a valve-like orifice when near approximation, not unlike that of the semilunar valves of the aorta. The ingoing current of air thus has a tendency to render their closure more complete when they are brought near together. This action will be more clearly appreciated by reference to Fig. 151.

The clinical features of the disease, so far as the larynx is concerned, are confined to the paroxysmal attacks of dyspnœa, and any other symptoms which present are dependent upon the disease which gives rise to the laryngeal paralysis, such as a central nerve lesion, aneurism of the aorta, tumor of the mediastinum, bronchocele, enlarged lymphatic glands, locomotor ataxia, or other lesion involving either the nerve centres or trunk.

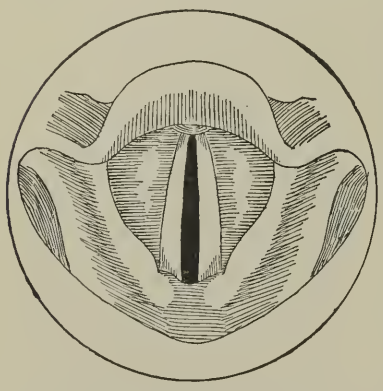

Fig. 152.—Bilateral Paralysis of the Abductor Muscles.

Diagnosis.—The recognition of the disease depends upon a laryngoscopic examination, which will show the cords lying practically motionless near the median line. During the act of inspiration, we find the chink of the glottis narrowed and the cords in a position of parallelism (see Fig. 152), leaving a space of from one-eighth to one-tenth of an inch, while in expiration the rima is opened by the pressure of the outgoing current of air. During phonation, which is accomplished with ease and in the normal manner, the cords are brought into close apposition and vibrate as in health.

I know of no disease which presents a laryngoscopic appearance that can be mistaken for this form of paralysis, unless we except ankylosis of the crico-arytenoid joints, in which the fixed position occurs usually with the cords also in the median line. This form of ankylosis in most instances occurs in connection with some of the graver diseases, such as cancer of the œsophagus, tuberculous laryngitis, and in rare instances in syphilis.

Prognosis.—This is not a disease which in itself ordinarily involves any very great danger to life, although of course in any given case the prognosis will depend largely on the ascertained cause of the affection, as bearing on the danger to life, on the hope of recovery from laryngeal impairment. A number of instances have been reported in which death from dyspnœa has occurred; but after the insertion of a tracheotomy tube such patients may live apparently indefinitely.

Those cases in which the disease develops rapidly seem to afford the best hope of ultimate recovery.

When the abductor muscles have been paralyzed for at least nine months, the degenerative changes have progressed to such an extent as to render a return of motility impossible.

Treatment.—If the paralysis is due to pressure on the nerve trunk or to central lesion, any treatment directed to the laryngeal manifestation will be only a waste of time and a needless tax upon the patient. If a careful investigation of the case warrants the opinion that the lesion is peripheral, it becomes our duty to remove any inflammatory or other local condition that may be found in the mucous membrane of the larynx, while at the same time the attempt should be made to restore motility to the paralyzed muscles by the application of the electric current, by the administration of strychnine, by massage, and by such other measures as may seem indicated.

No prominent mention has been made of syphilis as a cause of the disease, and yet a number of instances have been observed of this character. The indications for treatment in a case in which its syphilitic origin can be determined seem perfectly clear for the administration of full doses of iodide of potassium. In addition to this, there can be no question as to the advisability of subjecting the paralyzed muscles to the action of either the faradic or galvanic current, according to the reaction which is obtained by experimental test.

While it is doubtful if motility can be restored to a muscle after the paralysis has existed for a period longer than nine months, yet in no instance should the attempt be omitted while there seems any hope whatever of eliminating the cause of the affection.

If the remedial measures are not immediately followed by an amelioration of the condition, as shown by an increased separation of the cords in inspiration, there can be no question as to the propriety of tracheotomy. It is certainly not wise in these cases to defer the operation until the dyspnœic symptoms render it absolutely imperative. The number of patients who have perished from suffocation clearly shows that a fatal paroxysm is liable to occur at any time; furthermore, this may happen when the immediately preceding symptoms have not been especially urgent. Another point which argues in favor of an early tracheotomy is the fact that, after the laryngeal muscles are put at rest by a tracheal opening, we can hope for far better results from internal medication and local electrization than while the patient is suffering from the recurrent dyspnœic paroxysms.

Krause, regarding the disease as of spasmodic origin, suggests the propriety of dividing the recurrent laryngeal nerve on both sides. The result of this would be to throw each cord into the cadaveric

position. The dyspnœic attacks would certainly be relieved, but the voice would be lost.

Unilateral Paralysis of the Abductors.

This form of paralysis differs in no essential degree from the bilateral form already discussed, except that it involves but one side of the larynx and therefore gives rise to a somewhat different train of symptoms. As in the former disease, I believe that in most instances it is due to a lesion of the nerve centres.

Pressure on the trunk of the recurrent nerve has in some instances produced a simple paralysis of abduction, without involving the other muscles supplied by this nerve.

In rare cases the disease may be the result of peripheral conditions, such as acute inflammatory or other processes in the laryngeal cavity. Among other possible causes may be enumerated gout, rheumatism, lead poisoning, typhoid fever, diphtheria, and the other exanthemata.

During phonation the laryngoscopic image differs in no degree from the normal, the cords being perfectly approximated in the median line. During inspiration, however, the cord of the affected side remains motionless, while its fellow is abducted in its normal arc. The only form of paralysis with which it can be confounded is that of the recurrent nerve involving one side, in which the cord assumes the cadaveric position. In the latter disease the cords are approximated, but the chink of the glottis runs in an oblique direction from before backward, while at the same time the arytenoid cartilage of the movable side is brought in front of its fellow. In the disease under consideration, the chink of the glottis during phonation is in perfect alignment from in front backward.

The symptoms directly referable to the laryngeal condition are so little marked that many of these cases have been discovered accidentally.

In a number of cases reported dyspnœic symptoms have been present; they are never paroxysmal in character, but constitute simply a shortness of breath on exertion. This probably is the result of the disease which causes the paralysis, such as a bronchocele, an aneurism, or other tumor pressing on the nerve trunk.

To what extent a unilateral abductor paralysis is to be regarded as the precursor of the bilateral form, it is perhaps not easy to determine. The possibility of this danger, certainly, is to be borne in mind.

The indications for treatment of this form of the disease are prac-

tically the same as those already discussed in connection with the double abductor paralysis, with the exception, of course, that tracheotomy for the relief of dyspnœa is never demanded.

Paralysis of Individual Muscles.

In this group we consider those instances in which impairment of motility is observed in the various other muscles of the larynx not already considered, and in which the lesion is the result purely of myopathic causes.

These cases do not occur frequently, with the exception perhaps of paralysis of the arytenoideus muscle. In the very large majority of instances they result from local inflammatory processes, either of an acute or chronic character, invading the mucous membrane of the larynx. In other cases they may be dependent upon over-use or straining of the voice. When met with in cases of syphilis and tuberculosis and other grave lesions of the larynx, they are to be regarded as purely adventitious in character.

When it occurs in connection with anæmia, malaria, gout, or rheumatism, the laryngeal lesion is due, I think, to the fact that the muscles are weakened by some local inflammatory process set up by the general condition, under the influence of which muscular contractility is destroyed by some over-use or strain of the voice. "Hysterical aphonia," will be considered later, as constituting a paretic rather than a paralytic condition.

The causation of all these so-called myopathic paralyses is probably the same; the other features of the affection require separate consideration.

Unilateral Adductor Paralysis.—I have never seen a case in which I felt warranted in making a diagnosis of this form of paralysis, though its occurrence has been occasionally reported, and I fully agree in the assertion that it requires an exceedingly expert eye to draw a distinction between the position of the cord in extreme abduction and the cadaveric position.

That this condition may occur as the result of injury of the pneumogastric I cannot accept, nor do I believe that paralysis of this muscle can occur from any known lesion of the central or peripheral nervous apparatus. In the nature of the case, it must be purely of a myopathic character, in which form it has been observed to follow lead poisoning, diphtheria, exposure to cold, etc.

The only symptoms which are the direct result of the laryngeal lesion are either impairment or complete loss of voice.

Laryngeal examination will show one or the other cord lying

motionless in a position of extreme abduction. During phonation, the cord of the opposite side is brought around as far as possible toward its motionless fellow, its arytenoid thus coming more or less completely in front of the other. It is difficult to diagnose between this condition and that of recurrent laryngeal paralysis, in which the cords assume the cadaveric position. Certain contributive evidences will be afforded by the condition of the tensor muscles, which of course are not affected in simple abductor paralysis.

Bilateral Adductor Paralysis.—I know of no cases of this form of the disease, other than the five reported by Mackenzie. They may have been hysterical in character, however, as in each instance there was noticeable movement in both cords. A genuine myopathic paralysis involving the lateral crico-arytenoid muscles might occur as the result of exposure to cold, lead poisoning, diphtheria, scarlet fever, or some other of the exanthemata. It would give rise to complete loss of voice, with phonatory waste, as already described in the discussion on double recurrent laryngeal paralysis, from which disease I know of no method of distinguishing it by laryngoscopic examination.

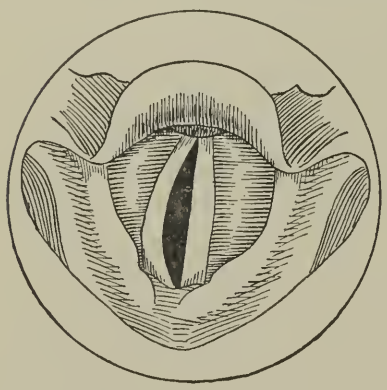

Fig. 153.—Paralysis of Left Internal Tensor.

Paralysis of the Internal Tensors.—This is by far the most common and most easily recognized of all forms of myopathic paralysis, and is the result of an impairment of contractility in the thyro-arytenoideus muscle, which, lying as it does immediately beneath the mucous membrane on the under surface of the cords, thus becomes liable to involvement in such morbid processes of an inflammatory character as invade this region. In this way it occurs commonly in connection with chronic laryngitis, although the direct exciting cause in most instances is the result of overstrain or prolonged use of the voice.

The symptoms are practically confined to phonation. The voice is not only weakened, but its range materially diminished, the impairment being more marked in the use of the higher notes. The ordinary conversational voice may not be impaired, although, if the muscular weakness is marked, these tones are lowered and approach somewhat in character to the whispered voice.

In most instances the affection is bilateral, although it may be confined to a single cord.

It is easily recognizable on laryngoscopic inspection. During phonation, the rima, instead of presenting the narrow, straight chink as in life, presents an elliptical opening. This is not the effect of a lateral separation of the cords, but is due to the fact that, in forcing the current of air through the chink, the cords belly upward in such a way as to present the appearance of an elliptical opening (see Fig. 153). This ellipse involves the whole length of the cord. If the paralysis confines itself to one side, it gives rise to practically the same train of symptoms with reference to the voice. Paralysis of the crico-thyroid muscle, as we have seen, gives rise to impairment of phonation and an elliptical or semi-elliptical glottis; but in this case the ellipse extends only from the receding angle of the thyroid cartilage to the vocal process. Moreover, the vocal cord, as we know, is practically a tendon of the thyro-arytenoideus muscle. If this latter is paralyzed, the vocal band assumes a narrowed and cord-like appearance; whereas if it is intact, it presents a somewhat broad and flat upper surface, even when the tensor action of the crico-thyroid is ablated.

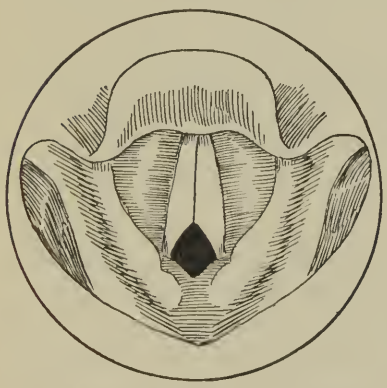

Fig. 154.—Paralysis of the Arytenoideus Muscle.

Paralysis of the Arytenoideus.—This muscle is especially liable to become involved in chronic catarrhal processes in the larynx, of long standing. Incipient phthisis, diphtheria, hysteria, and severe exposure have all been noted as causes of the disease. The voice becomes very seriously impaired, or even completely lost, from the fact that during the attempt at phonation only that portion of the glottis is closed which extends from the thyroid angle to the vocal processes, while behind these points a somewhat wide triangular opening is left, as seen in Fig. 154. The voice is either hoarse or completely lost, while the air escapes through this triangular opening during the attempt at phonation, to such an extent that conversation becomes fatiguing, and a frequent recovery of the breath becomes necessary.

Laryngoscopic examination clearly indicates the condition, the rima being practically normal in its anterior two-thirds, while the posterior third is found widely apart.

As we have already seen, this condition may occur as the result of a bilateral paralysis of the superior laryngeal nerve, but in the latter case there is also a paralysis of the crico-thyroid muscles, by which

the glottis presents an elliptical opening extending from the vocal processes to the thyroid angle.

Prognosis in Myopathic Paralysis.—The only grave symptom which attends a paralysis of any of the individual muscles of the larynx confines itself entirely to the question of restoration of voice. The longer the disease has existed, the less hope there is of complete recovery. On the other hand, when the disease depends upon some simple exposure or is the sequel of diphtheria or one of the exanthems, the tendency is toward spontaneous recovery. Paralysis of the internal tensors is perhaps the most obstinate of all these affections, in that the absolute rest which is demanded is exceedingly difficult to enforce. In most instances, probably, the hope of recovery will depend somewhat on the success of treatment directed to the removal of local lesions.

If a myopathic paralysis develops in connection with incipient phthisis, a natural suspicion would be excited of the presence of some tuberculous process in the organ. The simple anæmia or impaired general nutrition which accompanies this disease may predispose to the paralysis, however, in which case it should be overcome by proper measures.

Treatment.—The first indication is in the removal of such local lesion as may exist in the larynx, while at the same time such absolute rest of the parts is secured as may be possible. All prolonged or loud use of the voice is to be absolutely forbidden, and it may be well even to direct the patient for a while to carry on all conversation in the whispered voice.

For the restoration of the impaired muscle, we possess no remedy better than the application of the electric current. In most instances, the faradic current will afford the best results, although, if any given case fails to respond promptly to this, trial should be made of the continuous current. The applications should be made directly through the paralyzed muscle, as far as possible. Ziemssen's electrodes answer an excellent purpose in these cases. In using the single instrument one electrode is introduced into the larynx, while the other pole is applied directly over the larynx externally; the double electrode is devised for more direct application of the current to the muscle within the laryngeal cavity. These applications should be made every day, the sittings lasting from ten to fifteen minutes until a notable result is obtained, when the intervals may be prolonged.

This treatment is undoubtedly much aided by the internal administration of strychnine, while special attention should be directed to the general health, and iron and general tonics administered according to indications. Outdoor life, with a sufficient amount of exercise

and, if tolerated, the daily use of the cold bath with friction of the skin, should be enjoined, together with such other general hygienic measures as may seem wise.

Hysterical Aphonia.

This term is used to designate a form of aphonia which is characterized by a complete loss of voice, and which is purely functional in character. It is sometimes designated as hysterical paralysis of the vocal cords, and again as functional paralysis. The important point, and the one to be emphasized in the consideration of this affection, is that, while the condition is one that can always be assumed under voluntary effort, it is still one which is assumed by the patient under the influence of a strange psychical condition, or by whatever other term we may choose to designate it, and not one which the patient wilfully assumes with the desire to deceive or to excite sympathy.

Furthermore, hysterical aphonia or paralysis counterfeits only those forms of paralysis which can be assumed by voluntary effort. Abduction of the cords being purely an involuntary motion, and occurring only during the act of inspiration, paralysis of the abductors is not met with as a functional or hysterical paralysis. A unilateral paralysis of the vocal cords can never occur as a hysterical or functional affection. The condition seen is that of imperfect approximation of the cords, resembling somewhat the condition which we meet with in double paralysis of the recurrent nerve. The patient does, however, adduct the cords to a slight degree, and the sound produced by the passage of air through the partially closed rima glottidis is transformed into articulate speech by the lips and tongue, etc. The voice is lost, and the patient simply communicates in a whisper. The affection under consideration may simulate subacute or acute laryngeal catarrh; but the laryngeal examination will reveal the normal mobility of the cords, and, in addition, the source of the aphonia in the catarrhal inflammation of the mucous membrane lining the larynx, accompanied by swelling of the membrane covering the cords. Those cases of aphonia due to mechanical interference with the proper closure of the cords on account of thickening of the mucous membrane covering the arytenoids or the commissure may also be simulated, but will be easily recognized. The hysterical affection may resemble double paralysis of the recurrent laryngeal nerves; in this disorder, however, all the muscles of the larynx are completely paralyzed, the cords are absolutely motionless and in a position midway between extreme adduction and abduction. This position of the vocal cords cannot be assumed or simulated, for the instant that in-

spiration occurs the glottis will be widened and movement can be seen to take place. Hysterical paralysis is always bilateral, and always assumes the form of incomplete closure of the glottis.

A careful study of the larynx will clear up the diagnosis of these cases and enable the physician to determine that the aphonia is a functional disorder, and not due to any pathological lesion, simply by exclusion; for, as a rule, the laryngeal image does not and will not present a complete picture of any of the forms of genuine paralysis. There will also be accompanying evidences of the hysterical temperament. It should be added that cough is present in hysterical aphonia, while in genuine paralysis of the adductors it is entirely lost, the possibility of a cough being dependent on the ability to close the glottis. Furthermore, this form of laryngeal paralysis comes on without any previous warning whatever. The test which can be relied on with great certainty for diagnostic purposes is the administration of an anæsthetic. During the stage of excitement the patient will break into a very satisfactory use of the voice. The victims of this disorder are women from fifteen to forty-five years of age, and most frequently those unmarried, or those in whom the sexual life has been perverted.

Treatment.—It is utterly unsafe to treat these cases as unreal or as dishonest. So far as the patient is concerned, the paralysis is a genuine paralysis, as much so as if the trunk of the nerve were destroyed. It is, therefore, necessary to treat it as a real paralysis, by the removal of any exciting causes, such as uterine disease, etc., and by resorting to local treatment; the end in view is to convince the patient that she can use her voice. One way of accomplishing this is by resort to local measures of treatment for the relief of the morbid condition which she believes to exist, securing the patient's confidence and assuring her that at some designated time the complete restoration of the voice will be effected. In one case, a profound impression was made on the patient by the preparations for tracheotomy, with the result of completely removing the paralysis.

Spasm of the Glottis.

By this term we designate that sudden closure of the aperture of the larynx as the result of which the entrance of air is more or less completely shut off during the persistence of the attack, excluding the so-called cases of laryngismus stridulus.

The later writers seem to be divided somewhat between the teaching that the disease is due to central origin, or involvement of the motor nerves of the larynx, and the view that it is reflex in character.

It is a mistake to suppose that all cases can be assigned to any one lesion. As the affection presents features which differ greatly in infancy and in adults, it seems wise to consider it under two heads.

Spasm of the Glottis in Children.

That a neuropathic laryngeal spasm should occur in children, and that it should also be more common than in adult life, is quite easy to understand.

Etiology.—Rachitis seems to be the more common cause of the disease. Whether this is due to softening of the occiput, or to impaired nutrition, it is difficult to say. Probably, the latter is the correct view, as it is liable to occur in children whose health is undermined by improper food, bad hygienic surroundings, insufficient clothing, and other circumstances of this kind. With these predisposing causes, the attack is liable to be set up by any condition which might give rise to reflex disturbances in young children, such as prolonged crying, exposure to cold, an attack of whooping cough, dentition, or gastric or intestinal disturbances. That pressure on the laryngeal nerves, from enlarged bronchial or tracheal glands or any other cause, may give rise to the disease cannot be questioned. In most instances, it is met with between the ages of one and eighteen months, and is more common among boys.

Pathology.—The paroxysm is the result of a spasmodic contraction of the thyro-arytenoids, the lateral crico-arytenoids, and the arytenoideus. The glottic closure may also be due to paralysis of the posterior crico-arytenoid muscles.

The primary impulse which sets up the laryngeal spasm may originate in the cerebrum, in the motor centre of the larynx in the medulla, or it may arise reflexly from some local disturbances in the larynx, or in the intestinal canal, or, in fact, in any portion of the body. Underlying these is the impoverishment of the blood, with a resultant impairment of nutrition of the nerve centres.

Symptomatology.—The attack comes on suddenly and without warning. A child giving no evidence whatever of a local disturbance in the larynx is suddenly seized with an attack of dyspnœa of an inspiratory character, which may last at first only a few seconds or at the utmost from two to three minutes, when the symptoms subside. The paroxysm is attended with characteristic sonorous inspiration. The seizure generally occurs at night, the child starting up in bed, struggling for breath, and rapidly becoming cyanotic. The spasmodic character of the attack is also shown by the fact that the glottis is narrowed not only during the inspiratory act, but also during the

expiratory act, as evidenced by the obstructive sound which accompanies the latter. In certain cases the glottis is completely closed at the onset of the attack, so that both inspiration and expiration for the time are completely arrested. This may persist for from ten to twenty seconds, when the muscular contraction yields somewhat, allowing a limited amount of air to pass, although the dyspnœa may persist for some minutes even.

The attacks may recur at varying intervals, several taking place within twenty-four hours, or several days may elapse before a recurrence of the attack. In general, the tendency is toward an increase both in frequency and severity of the seizures. This may persist for a few weeks, when the attacks recur with a somewhat unvarying severity for a certain period, which is followed by a gradual amelioration of the symptoms. In other cases, the severity of the attack and the duration of the spasm may increase to such an extent that the child finally perishes from suffocation during an especially aggravated seizure. Even when there has been a notable improvement in all the symptoms, and when the attacks have apparently ceased for a considerable period of time, under the influence of some slight exposure, or perhaps an inflammatory attack involving the upper air tract, a relapse may take place in which a paroxysm may occur fully as grave as any previous attack.

In connection with laryngeal spasm, the child shows other evidences of irritation of the nerve centres, in the twitching of the limbs, extension of the feet, and clenching of the hands, while diaphragmatic spasm is not uncommon.

If the disease has persisted for some time, the child shows notable evidences of impaired nutrition. This is in part the result of rachitic habit or such general condition as may have given rise to the disease, but in no small degree to the disturbed sleep and the severe tax on the general nervous system.

Diagnosis.—Other diseases in young children are characterized by spasmodic attacks. A neoplasm gives rise to progressive dyspnœa, with impairment or complete loss of the voice. The spasm which occurs in these cases is a rare symptom, is somewhat mild in character, and is completely masked by the suffocative attacks, which are patently the result of some mechanical obstruction involving both inspiration and expiration. Instances of bilateral paralysis of abduction which commenced in childhood have been reported. In this disease the affection runs a more chronic course, the paroxysms of dyspnœa are longer and of not so severe a type; furthermore, evidence of that rigidity of the glottis which gives rise to both inspiratory and expiratory dyspnœa in true spasm is wanting. In addition

to this, in true spasm of the larynx we usually meet with convulsive movements in some other portions of the body. The disease with which laryngeal spasm is most likely to be confused is subglottic laryngitis, the clinical history of which is in most instances marked by recurrent attacks of spasmodic dyspnœa, which usually occur at night. Moreover, there is a certain progressive element in it, and it is accompanied by the usual train of catarrhal symptoms. The dyspnœic attacks are almost purely inspiratory in character. An attack of true spasm of the glottis is not infrequently precipitated by a catarrhal laryngitis, but it is usually of a mild type, and is not characterized by any prominent symptoms other than the loss of voice; whereas a subglottic laryngitis is attended by febrile disturbance, the peculiar croupy cough, and a certain amount of secretion.

Prognosis.—The disease is an exceedingly grave one, and the very large proportion of cases terminate fatally. In any given case the prognosis is unfavorable according to the severity of the attack, the shortness of the interval between the paroxysms, and the extent of impairment of the general health.

Treatment.—If the child is seen during the paroxysm, prompt measures should be taken to curtail its duration as far as possible by an abundance of fresh air, placing the child in a semi-recumbent position, loosening the clothing, applying sinapisms to the back of the neck, immersing the feet in hot water, and applying cold compresses to the head. The object of these measures is to diminish the blood pressure on the centres of laryngeal innervation. Any attempt to administer remedies by the mouth would be somewhat difficult. A sixteenth of a grain of morphine, in combination with one five-hundredth of a grain of atropine, given hypodermically, would be quite safe for a child of eighteen months, and probably would be attended with good results. Paregoric or one of the antispasmodics, such as musk or castor, may, if the paroxysms are prolonged, be administered by the rectum, although we can scarcely anticipate very prompt action when they are given in this way. Capmas suggested pressure on the pneumogastric nerves, thus interrupting the efferent nerve current, while Gavoy recommends pressure on the carotid arteries. The stimulating action of ammonia, as well as the antispasmodic action of chloroform inhalations, has been recommended by a number of observers. Unfortunately, during the paroxysm, in most cases, respiration is completely arrested, which would seem to eliminate any hope of success in this direction. The injection into the rectum of a few drops of chloroform suspended in milk or water would probably be attended by prompter results. The value of emetics, as recommended by many observers, is probably confined to those cases of laryngeal

spasm which are dependent upon a subglottic laryngitis. If the paroxysm is prolonged, and unconsciousness sets in, this is attended with general convulsive movements, which are to be attributed now probably more to the poisoning of the nerve centres by the arrest of oxygenation than to the original affection which precipitated the laryngeal spasm. This complication makes it imperative to relieve the dyspnœa, either by the introduction of a catheter into the larynx, by intubation, or by tracheotomy. In the absence of intubation instruments, tracheotomy would probably be the wiser resort, as in an emergency the instrument necessary for the performance of this can be improvised, whereas valuable time might be wasted in the futile attempt to insert a catheter into the larynx, since this latter is by no means a simple manipulation in very young children.

After the paroxysm subsides, the indications for treatment are to prevent as far as possible a recurrence of the attack, by combating the disease which has been its cause. The general health must be built up by the administration of cod-liver oil with the hypophosphites in connection with the syrup of the iodide of iron; careful attention should be paid to the clothing; the functions of the skin should be maintained by the daily use of the cold bath; and especial care is to be taken as regards the diet, which should be of the most nutritious character and at the same time easily assimilated.

Not infrequently a spasm is precipitated by the mere act of taking the breast, in which case it becomes necessary to feed the child with a spoon. The sleeping-apartments should be properly ventilated, and if possible the child taken daily into the open air. The possibility of difficult dentition is always to be borne in mind, and the gums watched for any source of irritation there. If such is found, free scarification should be promptly done. In the same way the condition of the bowels is to be carefully attended to and the fæces examined for evidence of imperfect digestion.

Among the remedies suggested to prevent a repetition of the attack are the bromides, chloral, antipyrin, physostigma, and curari.

Spasm of the Glottis in Adults.

The clinical history of spasm of the glottis as occurring in adult life presents an entirely different picture from that observed in children, in that it does not ordinarily involve any danger to life. Moreover, it is in most instances purely reflex in character, and is rarely dependent on any morbid lesion of the nerve centres, although we must undoubtedly recognize a somewhat abnormal excitability of the nervous system as predisposing to the attacks.

Laryngeal spasm may be excited by the entrance of food, drink, or other foreign substances into the larynx; by irritating topical applications, as by means of the sponge or probang; and by the presence of movable tumors. It also occurs in connection with tuberculous and syphilitic disease of this organ. In the latter cases it is altogether probable that the spasm is excited by the entrance of solid or liquid food into the cavity, the act of deglutition being seriously interfered with by these affections. In the same way, any affection which interferes with this act may be attended with laryngeal spasm, such as pharyngeal paralysis, ulcerative processes in the pharynx or œsophagus, as well as tumefaction in any portion of the fauces. In these cases the laryngeal spasm becomes a grave symptom, according to the extent to which the food is thus diverted into the air tract.

Aside from the above cases, the disease probably is largely confined to those instances in which the muscular contraction is a reflex phenomenon excited by some diseased condition, either in the larynx or in some other portion of the upper air tract.

I am disposed to think that the primary impulse which excites the glottic spasm in these cases is in most instances a reflex from the laryngeal membrane itself, and that the influence of diseased conditions of the parts above is largely in producing morbid conditions in the laryngeal cavity.

I do not wish to be understood as taking the ground that all cases are purely reflex in character, since, in rare instances, the spasm may arise from pressure on the efferent nerves. Thus, it has been known to depend upon pressure on the recurrent nerve by a bronchocele, and upon irritation of the internal branch of the superior laryngeal nerve, caused by a hyperæmic condition of the left pyriform sinus, the outer wall of which the nerve traverses.

It has occurred in connection with tetanic contraction of the muscles of the upper extremity. The laryngeal crises in the early stages of locomotor ataxia are probably spasmodic in character.

While, therefore, in exceedingly rare instances spasm of the glottis in adults may be excited by a central lesion or by pressure on the efferent nerves, in the large majority of cases we must seek for its cause in some reflex excitation having its origin in some portion of the air tract. Underlying these, in all instances, there is a peculiar nervous excitability, which renders these patients peculiarly subject to reflex disturbances. That the disease, therefore, should be more common in females than males we can easily understand. On this account we should suppose that hysteria might be a cause of the affection. This, however, is doubtful. I regard it as an almost invari-

able rule that hysteria causes only those affections which can be perfectly simulated by purely voluntary effort.

Symptomatology.—The only notable feature of the clinical history of laryngeal spasm in adults is the fact that it most frequently occurs at night, and usually during sleep. The patient is suddenly awakened by a paroxysm of dyspnœa, which presents the characteristic features of glottic spasm, the labored and crowing inspiration, the struggle for breath, and the rapid supervention of cyanosis. The attack lasts from five to twenty seconds, and gradually subsides. This may be repeated again during the same night, or the attack may not recur for a considerable period. There is no periodicity of the disease, as is characteristic of the spasm in children. The severity of the paroxysms and their frequency of recurrence are largely dependent upon the actively predisposing and exciting causes.

The nocturnal attacks seem to be somewhat characteristic of those cases in which the spasm is a reflex disturbance from some diseased condition of the upper air passages. The occurrence of a glottic spasm in an adult during waking hours should lead to the suspicion, at least, that the disease is dependent upon some morbid condition of the nerve centres, or upon pressure on the nerve trunk. When it is a crisis of locomotor ataxia, it is more apt to occur in the daytime and is usually preceded by a cough.

Diagnosis.—The clinical history of the case enables us easily to establish the diagnosis: the main interest however, is in ascertaining the cause of the affection. The elimination of a diseased condition of the nerve centres, or pressure on the efferent nerve trunk, suggests the reflex character of the seizures. This will be more fully established by discovering some diseased condition of the upper air tract, such as atrophic or hypertrophic rhinitis, deflected septum, nasal polypi, pharyngeal adenoids, or other obstructive lesions either in the nasal passages or in the naso-pharynx. In exceedingly rare instances laryngeal crises constitute the first symptom of locomotor ataxia; in such cases the diagnosis is involved in no little difficulty. In most cases, however, of tabes, the laryngeal symptoms, if they exist, are accompanied with or preceded by other symptoms. If the attacks are the result of pressure upon one of the efferent nerves, this will be evidenced in the laryngoscopic image by the impairment of motility in the muscles supplied by that nerve.

The clinical history of bilateral paralysis of the abductors is marked by recurrent dyspnœic attacks, which present all the characteristic symptoms of laryngeal spasm. In these cases, also, the laryngoscopic image easily reveals the absence of abductor action in the movements of the glottis.

Prognosis.—These attacks involve discomfort and apprehension to the patient rather than danger to life. In my experience they are quite amenable to treatment, and an improvement in the severity of the paroxysms follows promptly upon remedial measures directed to the ascertained cause of the affection, when it has been reflex in character and dependent upon a diseased condition of the upper air tract; and even in cases in which it is dependent upon organic disease of the nerve trunk or the medulla, much can be anticipated from remedial measures to overcome the irritability of the mucous membrane of the laryngeal cavity or passages above, as may be indicated.

I know of no case of reflex laryngeal spasm in the adult which has terminated fatally, yet a number of instances have been reported in which tracheotomy became imperative.

Treatment.—Underlying these cases we must recognize a hypersensitive condition of the general nervous system. The first indication for treatment consists in measures directed to the control of this condition. This seems best secured by the administration of bromide of potassium or sodium, in from ten to fifteen grain doses three times daily. This is to be increased five grains daily until the desired effect is produced or bromism occurs. In addition to this, the judicious use of the cold bath should be enjoined for its general tonic effect on the nervous system, as well as for the purpose of stimulating healthy activity of the cutaneous functions. The wearing of thin woollen underwear, a certain amount of outdoor life, with physical exercises, and such other hygienic measures as may seem indicated, will aid much in this direction.

If atrophic rhinitis exists, the laryngeal spasm is to be attributed to the drying up of the mucous membrane of the larynx as the result of the deficient secretion of serum in the nasal cavity; hence the constant and frequent use of the douche or spray becomes imperative in connection with other measures.

If nasal polypi, deflected septum, pharyngeal adenoids, or other obstructive lesions are found, these are to be removed. When the disease is dependent upon a morbid condition of the nerve trunk or centres, the same indications are present, and afford us a means of relieving the severity of the spasm; for in such cases the severity of the glottic spasm may be notably aggravated by any morbid condition of the mucous membrane of the larynx or the parts above, and even when such lesion does not exist in the air passages, the irritability of the parts may be controlled by soothing local applications, such as a two-per-cent solution of cocaine, or perhaps inhalations of an infusion of poppies, lupulin, conium, benzoin, or other local sedatives.

If the paroxysms are of such a severe type as to imperil the safety of the patient, the temporary insertion of a tracheal canula may become necessary until the exciting cause of the spasm has been removed.

Laryngeal Inco-ordination.

In addition to the various neuroses of the larynx already described, we have a group of affections in which the essential feature of the disease consists in a deficiency in the co-ordinate control or direction of the laryngeal muscles. This lack of co-ordination manifests itself in the form of a spasmodic contraction of the glottis. In the group of diseases under consideration, the spasmodic contraction has entirely to do with expiration.

The affections under this head are: *First*, chorea of the larynx; *second*, dysphonia spastica; and *third*, laryngeal vertigo.

Chorea of the Larynx.—The prominent feature of this form of laryngeal spasm consists in a persistent, noisy, dry cough, which closely resembles the bark of a dog. In some cases it occurs every two or three minutes, or even more frequently, from the time of waking in the morning until the patient falls asleep at night. In other cases the intervals are somewhat irregular. The tone of voice is not affected, and conversation between the seizures is usually carried on easily, although occasionally articulation may be somewhat jerky and spasmodic in character. It is preceded by no recovery or drawing in of the breath, as is characteristic of an ordinary cough, but comes on instantly without regard to respiratory movements, and is completed with a single bark in most instances, although in certain cases there is a succession of barks of diminished intensity. It occurs usually at about the age of puberty, and mostly in females.

These cases usually tolerate a laryngoscopic examination, and in this way the spasmodic character of the glottic contraction is readily observed. During the intervals the movements of the larynx are normal, vigorous, and well co-ordinated. The occurrence of the paroxysm is evidenced by the sudden and sharp closure of the glottis; the cords are driven together, as if by some great external force. After the cords have remained in this approximation for one or two seconds, they are again separated by a somewhat similar quick movement, being drawn well back to the sides of the larynx. This glottic spasm seems to excite a sudden expulsive effort on the part of the expiratory muscles of the thorax, by which the glottis is forcibly opened after the closure has persisted for one or two seconds, and this is accompanied by the characteristic loud bark peculiar to the paroxysm.

The choreic character of the disease is still further manifested by

the fact that we occasionally meet with similar choreic movements in other portions of the body, although these are absent in the majority of cases.

Dysphonia Spastica.—This affection, which is designated both as aphonia and dysphonia spastica, differs from laryngeal chorea, in the fact that the glottic spasm occurs only during an attempt at phonation. The disease is practically one of adult life, and occurs more frequently in females than males.

The onset of the attack is marked by impairment or complete loss of voice. This is soon followed by the development of the peculiar spasmodic character of the disease, under the influence of which, whenever the patient attempts to phonate, the cords are brought into such absolute apposition that the glottis is completely closed, thus preventing the exit of air for phonative purposes. This closure in all cases involves the ligamentous glottis, but occasionally the cartilaginous glottis may remain slightly patulous. In some instances the closure of the glottis is not sufficient to completely prevent the exit of air, but in these cases the tension is such that the voice is thrown into the falsetto register. In many cases the disease seems to develop in individuals from over-use of the voice, and the spasm is precipitated by an attempt to bring into use the overtaxed and wearied muscles.

The spasm appears to continue so long as the impulse from the phonatory centres is sent along the efferent nerves, and ceases instantly upon the cessation of the conscious effort to talk. When the attempt at phonation is persisted in cyanosis may occur. If a laryngoscopic examination is made, the movements of the larynx will be found normal and vigorous in every way. On attempts at phonation the cords will be adducted as in health. Immediately upon approximation, however, a spasmodic contraction ensues. So close is this approximation that one cord may overlap the other, while one of the arytenoid cartilages falls in front of its fellow. Immediately upon the abandonment of the attempt at phonation, the normal respiratory movements of the larynx are seen to take place.

Laryngeal Vertigo.—This is a curious form of laryngeal spasm which is followed immediately by vertigo and loss of consciousness. A patient in apparently perfect health is suddenly seized with a sense of tickling or irritation of the larynx, which produces a slight cough. This is immediately followed by an obscurity of vision, dizziness, and he falls to the floor in a state of complete unconsciousness. This lasts for a few seconds, when consciousness returns. The attack entails no sense of either physical or intellectual weakness or discomfort; in other words, the recovery is absolutely complete. Ordinarily, there are no premonitory symptoms.

The attacks recur at irregular intervals varying from a few days to weeks and even months, and usually come on without assignable cause, although in some instances they seem to have been precipitated by nervous excitement, weariness, or over-exertion. In mild attacks the seizure may pass away with the occurrence of simple dizziness and obscurity of vision, and before unconsciousness has occurred. Muscular twitchings during the unconscious state of the attack have been noted in a few cases.

Immediately preceding the attack, the patient draws a full inspiration, when, the glottis being closed by spasmodic contraction, expiration is arrested. The futile attempt to force the air through the closed glottis results in increased intrathoracic pressure, interruption of the circulation, and marked diminution of the vigor of the cardiac contractions. The ultimate result of these conditions is a disturbance of the circulation of blood, both about the motor centres of the larynx in the medulla, and also in the psychic centres of the cranial cavity. These phenomena seem to occur usually in individuals of a neurotic habit.

In most instances the laryngeal cavity presents no evidence of local morbid lesion, although in some cases observed the attacks seemed to be dependent upon a catarrhal laryngitis.

The disease is a somewhat rare one.

It is easily recognized by the clinical symptoms, and the diagnosis is not dependent in any way upon laryngoscopic examination.

Prognosis.—None of these affections involve any dangerous tendencies, so far as life is concerned. In chorea and dysphonia spastica the disease is an essentially chronic one, and often resists for a long time all methods of treatment. In laryngeal vertigo, on the other hand, the prognosis seems to be favorable as regards treatment, in that all cases so far reported seem to have been permanently cured after a comparatively short course of medication.

Treatment.—All these cases, being of neurotic origin, demand that our first efforts should be directed toward the correction of the systemic condition. For this purpose general tonics, such as barks and iron, cod-liver oil and hypophosphites, may be used. Strychnine is usually contraindicated. The preparations of zinc, belladonna, and phosphorus have been extensively used, but without any notably good results. The stimulating and tonic effect upon the general nervous system of cold water, in the form of either the sponge, shower, or tub bath, is so well known that its value in these cases cannot be questioned. Its best effect is in producing a certain amount of shock upon the system, and this of course is secured most promptly in the use either of the shower or douche. The action of the bath is to be

closely watched, and its use can only be continued, of course, in those cases in which a proper reaction follows the immersion. Among general hygienic measures which are to be considered are the proper regulation of the clothing, exercise, fresh air, the regulation of the diet, and the proper ventilation of living and sleeping apartments.

Too much importance cannot be attached in these cases to the correction of such morbid conditions as may be found in the upper air tract. While in probably all these cases the neurotic habit is the active predisposing cause of the attack, I am confident that the outbreak is in many instances directed to the larynx by some diseased condition of either the nasal passages or the faucial region.

There are certain special points to which attention should be called in connection with the separate affections.

Chorea of the Larynx.—The first indication for treatment in this affection is in the correction of any morbid condition which may be found in any portion of the upper air tract. Even when there is no local lesion in the larynx or air tract, soothing applications undoubtedly afford temporary relief. For this purpose we may use inhalations of conium, hyoscyamus, lupulin, papaver, or hot steam, or perhaps resort to local applications of solution of morphine or cocaine.

The literature of the subject seems to indicate that in a majority of cases the remedies which have shown the best results, in addition to general hygienic measures, have been bromide of potassium given in full doses and the faradic current, although Knight recommends the use of the continuous current.

Dysphonia Spastica.—In this form of inco-ordination the indications for treatment are practically those already enumerated in connection with chorea of the larynx, with the addition of such complete rest of the organ as can be enforced, together with the use of the constant current, applications of which should be made daily until a cure is effected.

Laryngeal Vertigo.—The neurotic element is especially prominent in this form of laryngeal inco-ordination; and in addition to the general measures already referred to, the patient should be brought thoroughly under the influence of the bromides.

If, however, any morbid condition of the upper air tract is found, the bromides will fail of their beneficial action until this is corrected by proper treatment.

CHAPTER LXXXIX.

FOREIGN BODIES IN THE AIR PASSAGES.

The entrance of a foreign body into the larynx or air passages below during the acts of mastication, deglutition, or inspiration or otherwise gives rise to more or less grave symptoms, according to the size, character, and location of the body.

Etiology.—The articles which may thus make their way into the breathing-tract cannot well be enumerated, comprising as they do almost every known substance, such as pins, coins, particles of food, pebble-stones, natural and artificial teeth, peas, beans, fragments of bone, buttons, nutshells, lumbricoides, hydatids, etc.

In the large majority of instances the accident occurs during the act of inspiration, the individual drawing a heedless or perhaps involuntary breath while food or other solid matters are in the mouth. Children occasionally fall asleep with foreign bodies in the mouth, such as coins, buttons, toys, etc., which are thus very liable to make their way into the air passages.

False teeth also occasionally become dislodged during sleeping-hours and fall into the air passages. As a rule, however, they are arrested in the pharynx.

The pharynx is the seat of a very high degree both of motor and sensory innervation, and in the very large majority of instances when a foreign body reaches the pharynx it is immediately expelled by the prompt reflex action which its presence excites. When this sensibility is diminished, as during sleeping-hours, we can easily understand how conditions are established which favor the passage of foreign bodies beyond this region, and into the larynx and trachea. The pharyngeal insensibility of anæsthesia is even still more marked than that of sleep, which will in part explain the accidents which occur in this state. Some cases have been reported in which the foreign body has come from below, as, for instance, that of a diseased bronchial gland which has made its way into the bronchial tube by an ulcerative process and passed up into the larynx; or the occlusion of the larynx by cheesy matter from an ulcerating bronchial gland.

Symptomatology.—In very rare instances a foreign body may

make its way into the air passages without the individual being cognizant of the accident, the symptoms being delayed until local inflammatory changes set in, giving rise to cough, pain, dyspnœa, etc. In the very large majority of cases, however, the occurrence of this accident makes itself known by the immediate development of symptoms of a somewhat distressing character. The patient is seized with a sudden choking or gasping for breath, with a feeling of impending suffocation. The dyspnœa is usually of an inspiratory character, the presence of the foreign body setting up a spasm of the larynx. The alarm and anxiety of the patient is shown by his restless movements; he rushes to the window or door in a hopeless effort to obtain air; the eyes protrude and the face soon becomes livid from defective oxygenation. These symptoms may continue until death ensues, or at the end of a few minutes they may gradually subside and fairly normal respiration set in. The subsequent history of the case is marked by recurrent attacks of a dyspnœic character, apparently dependent somewhat on the position and movements of the individual, and perhaps on the character and location of the foreign body. If the substance be smooth and rounded, and possess no especially irritating properties, it may remain in the air passages for years without giving rise to notable local changes.

As a rule, the impact of the foreign body upon the delicate structures of the air tract gives rise to inflammatory and ulcerative processes. Among the direct results of its presence, therefore, we may enumerate, according to its location, laryngitis, œdema of the larynx, abscess of the larynx, inflammation or ulceration of the trachea or bronchi, emphysema, pneumonia, pleurisy, abscess of the lungs, and necrosis of the cartilages, either of the larynx or trachea. As the result of these conditions the continued presence of the foreign body thus gives rise, if in the larynx, to hoarseness, loss of voice, and recurrent or permanent laryngeal spasm, with cough and expectoration. If the foreign body is located in the trachea or bronchi, we have persistent cough, with more or less muco-purulent expectoration, which is perhaps tinged with blood, together with dyspnœa. The long-continued presence of the foreign body, with its resultant ulcerative action, gives rise to marasmic symptoms, as progressive loss of flesh, febrile disturbance of a hectic nature, night sweats, loss of appetite, and other symptoms which so closely resemble an attack of pulmonary phthisis as to lead not infrequently to a mistaken diagnosis. If pneumonia, pleurisy, or other secondary morbid process set in, it gives rise to symptoms characteristic of such affection. The bronchitis which occurs is peculiar, in that it assumes somewhat of an intermittent character. In addition to the above symptoms, pain is

almost constantly present in these cases, and it usually locates itself in such a way as to indicate clearly the position which the foreign body has assumed in the air passages.

Hemorrhage is not ordinarily a prominent symptom, yet in a case which came under my own observation this was the prominent feature of the affection.

Diagnosis.—The history of the case ordinarily will establish the character of the accident; in the absence of any such history, we have no means of definitely determining the existence of a foreign body in the breathing-passages, except in those cases in which its lodgement is in the larynx or trachea, when it can be brought under ocular inspection by the use of the laryngoscope. Digital exploration, of course, is of value only when the object is in the larynx.

The main interest in this connection has to do with the location of a foreign body which has passed into the bronchi. In most instances the right bronchus is invaded, on account of its anatomical position. The subjective symptoms, especially that of pain, as before noticed, will of course aid us in locating the object. Also auscultation may detect its immediate location by the peculiar harsh or sonorous râle which results from the air passing in respiration, provided the tube is not completely occluded. If the latter condition exists, we are compelled to depend largely on the absence of the respiratory murmur in that portion of the lung supplied by the occluded bronchus. Cohen makes the note that obstruction of the left bronchus causes an absence of respiratory murmur over the entire left lung, while occlusion of the right bronchus usually produces absence of the respiratory murmur over the lower lobe alone of that side; the division of that bronchus taking place much nearer the bifurcation, and foreign bodies rarely lodging above the point of vision.

In the case of a foreign body in one of the bronchi giving rise to symptoms closely resembling pulmonary phthisis, and without a previous history of its entering the passages, the question of diagnosis becomes one of no little difficulty. A unilateral bronchitis with recurrent exacerbations and muco-purulent expectoration tinged with blood, accompanied by progressive loss of flesh and hectic fever, ought certainly to suggest the possible presence of a foreign body as the cause of the symptoms, especially if an examination of the sputa fails to detect the tubercle bacillus.

Prognosis.—The entrance of a foreign body into the air passages is to be regarded as an accident of an exceedingly grave character, and presents a very serious menace to life, either from the immediate symptoms which arise, or from the secondary morbid processes which are liable to develop in the air passages.

Immediately upon the entrance of a foreign body into the air tract, nature endeavors to expel it by the instant cough and other reflex movements which are set in play. In the very large majority of instances these are successful.

Combining the statistics of Gross, Durham, and Weist, we have 1,674 cases. An analysis of these shows that without operation death occurred in 28.6 per cent, and in 25 per cent after operation. Of course the idea is not intended to be conveyed that the results in the operative and non-operative cases are to be compared, for, as we have seen, a large percentage of the patients in non-operative cases died before relief could be afforded.

There seems to be no limit to the time in which voluntary expulsion may take place, as it has been known to occur at all times from one day to sixty years. There can be no question as to the propriety of extracting these substances at the earliest period possible, however, whether with or without operative procedure; and, furthermore, even after the expulsion of the body the danger to life has not been removed.

TREATMENT.—Our first effort in any given case should be directed toward ascertaining the character and location of the foreign body with which we have to deal.

After the acute manifestations have subsided, such as choking, spasm, etc., as they usually do in the course of a few minutes, the gravity of the situation can be determined by the symptoms which remain. If the dyspnœa is of such a character as to threaten suffocation, of course immediate resort should be had to operative interference. If, however, the symptoms are not urgent, an effort should be made to secure the expulsion of the foreign body through the natural passages.

The administration of sternutatories and emetics is of doubtful value. Much more can be hoped for by a well-directed and intelligent voluntary expiratory effort. The patient should be directed to take a slow, deliberate, and full inspiration, after which the air is to be forced out violently, in the hope of dislodging the substance. This manipulation is aided by violent blows upon the chest at the time of the expulsive effort. An additional aid is also secured by inverting the body, in the manner so successfully resorted to by Padley for the removal of a coin from the windpipe. The patient sat with his knees fixed over the elevated end of a strong bench, when upon lying down on his back the coin fell into the mouth. The advantage of the supine position over the prone is that, in case of the body lodging against the rima glottidis, the spasm which would ensue is avoided by the quick recovery of the erect position. Most writers

seem to think that there is a certain amount of danger attendant upon the attempt to secure the expulsion of a foreign body by position, owing to the risk of its becoming impacted in the chink of the glottis. On this ground Weist is of the opinion that it should never be practised without previously opening the air passages. I am disposed to think the danger greatly overestimated, and it certainly is very largely eliminated by Padley's ingenious plan, with reference to smooth, round bodies. If we have to do, however, with bodies of irregular shape and sharp edges, this danger must be kept in view, whatever manipulations are resorted to.

In case of failure of the above methods, our subsequent resort is to the use of forceps and other instruments for extraction in those instances in which the foreign body lies in the larynx. This is accomplished either with the aid of the laryngoscopic mirror or the index

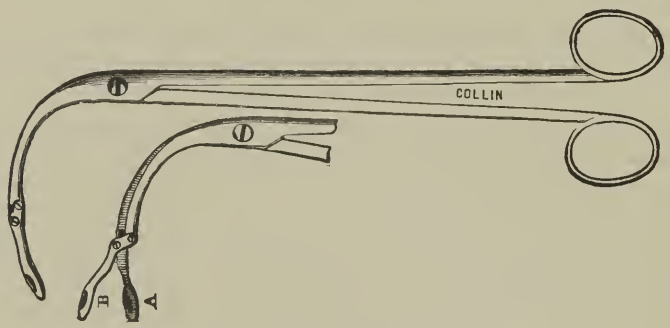

Fig. 155.—Cusco's Laryngeal Forceps.

finger inserted into the larynx. In most cases probably the Cusco forceps (see Fig. 155), on account of the firmness of grasp and freedom of play of the blades, will answer better purposes. Figs. 156 and 157 illustrate an interesting case reported by Grazzi, in which a horizontal grasp was necessary for the extraction of a coin from the laryngeal ventricle. Gruening makes the suggestion that, in a case in which there is danger of the body becoming dislodged in the larynx and dropping into the trachea during the manipulation, preliminary tracheotomy should be performed. In the case of jagged bodies, the danger of injury to the soft parts, by which permanent vocal impairment may result, is always to be borne in mind, and it occasionally may seem wiser to crush such substances as nutshells, pieces of bone, etc, rather than to lacerate the tissues in their extraction. In case the impaction is the result of localized swelling, of course it may seem wiser to await the subsidence of this. Brandeis extracted a thread from the larynx by means of a brush dipped in mucilage.

These operations through the natural passages in adults are very easily accomplished without anæsthesia. With children, however, it will become necessary in most instances to administer an anæsthetic, to secure not only proper control of the patient but also tolerance of the passages. Laryngoscopy in young children during anæsthesia is by no means an easy matter in all cases. In such a case the index finger in the larynx not only serves to explore the cavity, but also acts as a guide to the forceps.

In case of failure of the above methods tracheotomy becomes necessary to relieve the dyspnœa due to the impaction of a foreign body in the larynx; to secure access to such body; to secure better access to the lower air passages, or in rare instances as a precautionary measure in the manner already alluded to. As a rule, the indications are for a low tracheotomy, although it may be occasionally necessary, in order to obtain access to a substance in the laryngeal

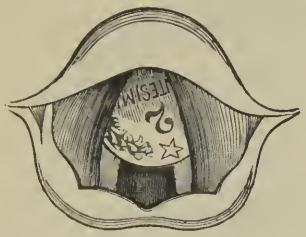

Fig. 156.—Coin in Laryngeal Ventricle (Grazzi).

Fig. 157.—Coin in Grasp of Forceps, showing Method of Removal employed in Grazzi's Case.

cavity, to perform high tracheotomy, or a crico-thyrotomy, or even a thyrotomy; even in those cases in which it becomes necessary to open directly into the larynx, it is probably wiser first to perform the low tracheotomy.

After the performance of tracheotomy, the foreign body may be extracted by manipulation through the mouth, or instruments may be inserted through the tracheal opening and the object forced into the oral cavity. When the operation is done for a foreign body in the trachea or bronchi, it is not infrequently expelled immediately upon opening the trachea, or it may be forced up so near to the tracheal opening as to enable the surgeon to seize it with the forceps.

Failing this, it may become necessary to resort to the supine position, or succussion of the body, in order to detach it from the parts below and enable it to be forced up near to the tracheal opening. In case of failure of tracheotomy to bring the object within reach by the simpler manipulations, it is to be sought for by probes and forceps passed directly down into the trachea.

In order to obtain free access to the tracheal cavity for subsequent

manipulation, the edges of the incision should be held as widely apart as possible by proper instruments, such as Labord's dilator or Minor's retractor (see Fig. 158), or, better still, threads should be inserted into the tracheal rings and the parts held open in this manner. In a case reported by Wyeth, the edge of the tracheal wound was stitched to the integument, thus securing a permanent opening for subsequent exploration, the first having failed.

The exploration of the trachea may be done either with the finger

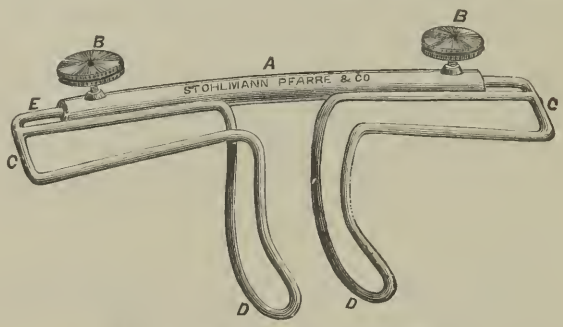

FIG. 158.—Minor's Tracheal Retractor.

or with a long slender probe bent at right angles, although a better process probably consists in using the forceps for exploratory purposes. Gross used a long, flexible forceps constructed of German silver, similar to those shown in Fig. 159. Cohen has devised a pair of shouldered forceps for this purpose. Jacobson reports the successful use of Stoerk's laryngeal-tube forceps, a most admirable device, in that the tube, being constructed of German silver, can be easily bent to a proper angle. Seiler's tube forceps (see Fig. 160) also serves an

FIG. 159.—Gross' Tracheal Forceps.

excellent purpose. If the foreign body be a small, jagged object, such as a nutshell or piece of bone, it will often be quite sufficient simply to disengage it from the soft parts. This can be done by a slender silver probe, with the end bent into the form of a hook. After dislodgement, it is usually easily expelled.

Of course, after the trachea is opened, still further inspection may be made by means of reflected light, a small mirror being inserted into the wound.

The insertion of the finger into the trachea for the purposes of locating or even dislodging a foreign body is always available, and the bifurcation can easily be reached in this manner.

The strength and endurance of the patient should never be taxed by too prolonged efforts at exploration and extraction of a foreign body immediately following the performance of tracheotomy, for the procedure can be postponed to the next day, or even for a week, without involving any additional danger to the patient. Moreover, after the windpipe is opened, dislodgement and voluntary expulsion can be anticipated at some future time. In view of this, it is scarcely necessary to add that the tracheal opening should not be occluded by the insertion of a tube, as in such a case the expulsion of a foreign body would thus be interfered with. In case it becomes necessary to postpone the attempt to a later period, the wisest procedure would be

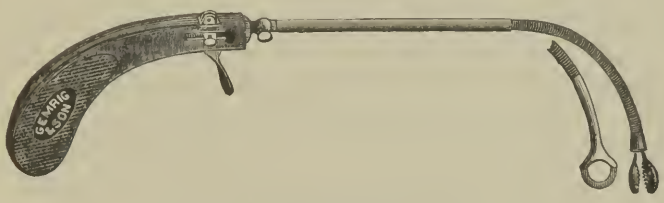

FIG. 160.—Seiler's Tube Forceps.

to stitch the edge of the tracheal wound to the integument, as was done by Wyeth.

Tracheotomy and subsequent manipulations having been unsuccessful, an expectant plan of treatment, for a while at least, is the wisest procedure in those cases in which the presence of a foreign body in the bronchus gives rise to no immediately dangerous symptoms. If, however, further interference becomes imperative, in such a case only is the resort to the operation recommended by Nesiloff, for exposing the bronchi, warranted. The patient being placed on his abdomen, a vertical incision is made three inches to the left of the median line and extending from the third to the sixth dorsal vertebra. From each extremity of the vertical incision two horizontal incisions are carried toward the vertebræ. The flap is then raised, uncovering the third, fourth, fifth, and sixth ribs, which are then cut through, upon which subperiosteal excision is made. The pleura is then pushed forward, and the bronchus searched for at the bottom of the wound. McBurney suggests that, considering the angle at which the left bronchus passes into the trachea, an incision might be made into the right side of the trachea, in such a locality as will afford direct access to this tube.

CHAPTER XC.

FRACTURE OF THE LARYNX.

This is an accident which is usually the consequence of a fall, a direct blow, or pressure on the organ, and may result in the fracture of a single cartilage, or two or more may be involved in the injury. It usually gives rise to symptoms of rather serious import, and is generally regarded as an exceedingly rare occurrence.

Etiology.—The direct cause of the accident may be either a fall from a height upon some projecting object, or it may result from a flying missile. In a number of instances the injury has been inflicted by a bullet. It also occurs in the act of garrotting or hanging, and during personal encounters either from a blow of the fist or from compression in being choked by an antagonist. Muscular action during coughing has caused the fracture.

It is generally stated that the ossification which the cartilages undergo with advancing years renders one more liable to this injury; yet a large majority of the cases which have been reported have occurred during the third, fourth, and fifth decades of life, while seven instances have been observed in which the accident occurred in the first decade.

Symptomatology.—The first result of the accident usually is an external deformity, which consists in a sinking in of the laryngeal prominence in the neck, unless the injury is the result of lateral compression, in which case an undue prominence is liable to occur. The injury to the soft parts gives rise to more or less extensive external tumefaction, which may be the direct result of the blow, or it may be due to any emphysematous infiltration of the tissues where the fracture extends completely through the lining membrane of the larynx. The internal injury necessarily causes rupture of the blood-vessels, and hence dyspnœa very early becomes a prominent symptom, either from the escape of blood into the air passages or into the submucous tissues. The dyspnœic symptoms may set in immediately upon the occurrence of the accident, or they may be delayed for some days. The voice, of course, is either impaired or completely lost. Cough is usually present, with pain on deglutition. The es-

sential and almost pathognomonic symptoms are, however, the dyspnœa and bloody sputa.

As regards the cartilages involved, Durham's report shows fracture of the thyroid alone in 24 cases, of the cricoid in 11, of the thyroid and cricoid in 9, of the thyroid, cricoid, and trachea in 2, of the cricoid and trachea in 2, of the thyroid and hyoid in 4, of the thyroid, cricoid, and hyoid in 2, of the cricoid, trachea, and hyoid in 1, while in 7 the exact location is not given.

The accident may result in a simple linear fracture, or the fracture may be comminuted and even compound.

Diagnosis.—The clinical history of the case, together with the evidence of external injury, the flattening of the laryngeal prominence, with the bloody sputa and dyspnœa, if present, constitute symptoms sufficiently characteristic. In addition to these, palpation of the parts enables one to recognize the deformity and the presence of emphysema by its peculiar crackling sound, and also in most cases the crepitation between the fragments. Laryngoscopic examination will show the distortion of the laryngeal cavity, with submucous extravasation, or the escape of blood into the air passages, as the case may be.

Prognosis.—The accident is to be regarded as one of no little gravity; this varies, however, somewhat according to the special cartilages involved. Thus, if the thyroid cartilage alone is the seat of fracture, the danger is much diminished; while cases in which the cricoid ring is crushed are generally regarded as almost invariably fatal. We find that in 62 cases reported by Durham, there were 12 recoveries; in 6 of these the thyroid alone was involved, in 2 the thyroid and hyoid, and in 4 the seat of injury was not recorded.

The injury gives rise to immediate laryngeal obstruction, while subsequently, if the patient survives, a somewhat prolonged suppurative process is liable to ensue. Furthermore, the emphysema may extend into the perilaryngeal or peritracheal tissues, or even as far down as the mediastinum. The fatal termination, therefore, may result either from suffocation or from the subsequent development of pneumonia, pleurisy, pulmonary œdema, mediastinal abscess, septicæmia, or some other complicating disorder.

Treatment.—Efforts should be made to control such inflammatory action as may develop, by means of counter-irritants, leeching, and cold dressings. If there is any displacement of the parts, they should be restored as far as possible by external manipulation, and held in place by light strips of adhesive plaster, while at the same time all movement in the larynx is controlled as far as practicable by not only the avoidance of the use of the voice, but of any attempt at deglutition, food being administered by the rectum if necessary, or

by means of a tube. The case must be watched with the greatest care, and preparations made for the performance of tracheotomy as soon as any evidence of laryngeal stenosis manifests itself. The canula should be inserted as low down as possible, for we are by no means able in all cases to determine how far the traumatism has extended.

Attention should then be directed toward the restoration of the parts to their normal position and the preservation of laryngeal function. If the tracheal canula is in position, this will be accomplished either by the manipulation of a probe in the larynx or by the insertion of bougies, or possibly thyrotomy may be demanded to obtain access to the larynx for the restoration of the parts or for the removal of projecting fragments.

If the patient survive the injury, the subsequent cicatrization may result in such a narrowing of the larynx as to render the permanent wearing of the tube a necessity. In such an event, the best results in treatment will probably be obtained by resort to intubation, not with the ordinary intubation tube, but with a conical instrument, by which dilatation may be accomplished.

CHAPTER XCI.

PROLAPSE OF THE LARYNGEAL VENTRICLES.

The possibility of prolapse of the laryngeal ventricles is placed beyond question by a number of well-authenticated cases. Tuberculosis existed in eight of the cases reported, and syphilis in two.

The only direct cause for the accident seems to be the violence to which the tissues are subjected during the act of coughing, when there exists at the same time a relaxed condition of the mucous membrane. It is possible that this may result in the severing of the attachments of the thyro-arytenoid muscle, and with it the attachment of the mucous membrane lining the ventricle.

The symptoms are either impairment or complete loss of voice, and, when the tumefaction has attained sufficient proportions, a moderate amount of dyspnœa is present. The diagnosis, at best, must be somewhat difficult. The tumor presents as a rounded or somewhat spindle-shaped mass, smooth in contour, of a pale pinkish tinge, or slightly injected; it lies directly upon the vocal cord, and seems to emerge from the ventricular fissure. It is soft in consistency, and easily indented by means of a probe. It should not be confused with a fibroid, which is a hard, dense tumor, irregularly nodulated and not pedunculated; moreover, fibroid tumors never arise from the laryngeal ventricle. The long clinical history of the disease, together with the absence of ulceration or glandular involvement, should be considered in the elimination of a possible malignant origin of the growth.

A certain amount of good can be accomplished by means of local astringents in reducing the size of the tumefaction. Successful replacement cannot be hoped for. Complete restoration of the vocal function can be anticipated only by treating the affection as a neoplasm and removing it. This may be done either by means of the snare manipulated through the natural passages, or, failing this, by performing thyrotomy. Jellenfy, regarding the affection as a sort of incarcerated hernia, endeavored in several of his cases to shut off the circulation by a series of superficial incisions over its contour, thus successfully reducing the prolapse.

CHAPTER XCII.

BENIGN TUMORS OF THE LARYNX.

The important place which the consideration of benign tumors of the larynx has occupied in the literature of throat diseases during the past thirty years and more would carry the suggestion that this form of disease possesses a clinical significance of unusual importance, and that the development of a laryngeal growth is to be regarded as a matter of no little gravity.

I am disposed, however, to think that its importance is somewhat overestimated, as I do not regard the existence of a benign tumor in the larynx as involving any especial danger to life. Yet I do not wish to be understood as in any way underestimating the importance of benign growths and their treatment.

The development, progress, and symptoms of the various benign neoplasms of the larynx are practically identical, and hence it will be found convenient to discuss them collectively, differentiating only when it seems necessary, as in the pathology and diagnosis.

The varieties of these tumors are: *Papillomata, fibromata, cystomata, myxomata, adenomata, lipomata, angiomata, enchondromata,* and *mixed tumors.*

Etiology.—It is exceedingly difficult to assign a definite cause for the development of a laryngeal neoplasm. It is usually stated that a hyperæmia of the mucous membrane, or perhaps a catarrhal inflammation, is the most active cause of the affection, and yet undoubtedly a large majority of the cases develop in a previously healthy larynx; certainly, in most of the cases which have come under my own observation not only was it difficult to discover any existing inflammatory affection to account for the disease, but the presence of the growth itself failed to excite any morbid process in the surrounding tissues. Traumatism, in the form of laryngeal strain, or overexertion of the voice, is undoubtedly to be regarded as a not infrequent cause of the disease. Exposure to cold, the inhalation of irritating vapors, eruptive fevers, etc., constitute active causes in some cases. In several instances warty growths have occurred in the larynx simultaneously with their appearance in other parts of the body.

Syphilis and tuberculosis are by many regarded as the cause of laryngeal growths. These often appear as wart-like excrescences, which develop usually on the anterior face of the arytenoid commissure, especially in tuberculous disease. These vegetations should be regarded as local manifestations of the constitutional taint rather than as distinct tumors. The disease belongs essentially to adult life. The great preponderance of cases occurring in males would seem to lend weight to the view that catarrhal inflammation is an active cause of the affection.

While growths in early life, especially of the papillomatous variety, are not rare, the statement that they are most frequent in early infancy is probably incorrect.

While the congenital origin of the disease is probably frequent, yet a number of well-authenticated cases have been observed.

Symptomatology.—A benign tumor in the larynx makes its presence known mainly by its interference with the function of phonation, and in rarer instances with that of respiration. It would seem, however, that a sessile growth in the aryepiglottic folds or epiglottis, or even in the ventricular bands, might develop without producing any notable impairment in the pitch or quality of the voice. While the ordinary conversational voice is not impaired, its volume and strength is affected, according to the size of the growth; and even though this may be very small, the voice is liable to be weak and tires easily, even after moderate usage, whether the tumor be located upon the cord or in other portions of the larynx.

The morbid condition, being confined to the larynx, very rarely gives rise to reflex disturbances; therefore the presence of a growth, even though it may be attended with a certain amount of hyperæmia of the mucous membrane, rarely gives rise to cough.

Interference with respiration, of course, is directly dependent upon the size of the growth, and to a certain extent upon its location as encroaching upon the chink of the glottis.

Spasmodic contraction of the muscles of the larynx occasionally occurs from the presence of the growth; this is especially true in young children. Pedunculated growths, whose favorite point of origin is near the anterior commissure of the vocal cords, will oftentimes give rise to dyspnœa when they fall below the glottis, which is completely relieved when they are blown out, as it were, upon the superior surface of the cords.

A catarrhal laryngitis, excited by the presence of a growth, rare in adults, is very common in young children As the result of this condition, nocturnal exacerbations of dyspnœa are frequent.

Hemorrhage is an exceedingly rare symptom, although when a papilloma is located near the vocal cords, and is subjected to attrition in the movements of the parts, its surface may become eroded, and the sputa be tinged with blood.

Pain is rarely, if ever, present, and only when the growth has attained a considerable size.

Fauvel reports in nearly a fourth of his cases a certain perversion of the sense of taste with excessive secretion of saliva.

Pathology.—The pathological characteristics of laryngeal neoplasms will necessarily be considered under separate heads.

Papillomata.—This form of neoplasm occurs more frequently than all other varities together. This is the form of growth to which Virchow applies the term "pachydermia verrucosa," in contradistinction to "pachydermia diffusa."

The essential morbid changes which characterize the two forms of the disease commence in the papillæ of the mucosa, giving rise to certain hypertrophic changes, which in the diffuse form of the disease expend themselves largely in the deeper tissues, without extending to the superficial layers of the mucous membrane or epithelial structures. In the former variety, viz., the pachydermia verrucosa or papillomata, the changes which take place not only involve the papillæ of the mucosa, but also extend to the epithelial structures on the surface. The activity of the process here, however, is found in the epithelium rather than in the mucosa. The process limits itself to a circumscribed area and consists of a localized efflorescence or proliferation of epithelial cells, which pile themselves up in such a manner as to produce practically a wart-like growth on the surface, instead of losing their vitality and undergoing desquamation as is usually the case.

The surface of a papillomatous growth is marked by numberless small rounded projections, each one of which probably marks the site of an individual papilla in the normal mucous membrane. If a longitudinal section be made through one of these papillary projections, there will be found occupying its centre the elongated papilla containing the original vascular loop, supported by loose connective tissue, and the whole surrounded by from fifteen to twenty layers of epithelial cells.

As a rule, a papilloma is sessile in character, though occasionally pedunculated. It may occur singly or in groups, and varies in size from a millet-seed to a growth more or less completely filling the supraglottic laryngeal cavity.

Thus, in adult life their growth is somewhat slow, while in childhood they develop with considerable rapidity. Their increase in

bulk is at the same time accompanied with a broadening of their base, by the involvement of neighboring papillæ.

As a rule, all forms of benign tumors confine themselves to the supraglottic portion of the larynx in adult life, although in children they occasionally extend below the cords.

Fibromata.—This form of growth occurs next in frequency to the papillomata, and constitutes from eight to ten per cent of all cases observed. It belongs essentially to adult life.

In composition it does not differ essentially from similar growths met with in other portions of the body. It is scantily supplied with blood-vessels, but is covered with a mucous membrane showing notable evidences of hyperæmia, which extends also beyond the limits of the growth, forming a well-marked areola. It is almost always sessile in form.

The favorite site for the development of a fibroma is in one of the vocal cords. Occasionally the growth in one cord gives rise to a similar condition on the opposite side. Aside from this, multiple development does not occur.

They present as small rounded growths, varying in size from a millet-seed to a hazelnut, though instances are reported in which the growth almost completely filled the supraglottic larynx. They present a smooth rounded outline, except in those cases in which the growth is multilobular.

Cystomata.—Up to comparatively recent times, this form of neoplasm was considered to be exceedingly rare. The inference would seem to be that it had either been completely overlooked or, more probably, its character mistaken, for it is undoubtedly of quite frequent occurrence. This form of tumor also belongs to adult life, usually occurring between twenty-five and fifty.

A cystoma is the result of an obstruction of the duct of one of the muciparous glands; its secretion becomes imprisoned, and, slowly increasing, distends the cavity of the gland. This is the view usually entertained in regard to the development of a cystoma, although whether it is due to a degeneration of the epithelial lining of the gland and an atrophy of the duct, or is the result of certain degenerative changes in the epithelial cells themselves, the duct remaining patent, is uncertain.

The site of its development is usually on the epiglottis and vocal cords.

It presents as a smooth, rounded, easily compressible, movable mass, covered with light red mucous membrane, and varies in size from the head of a pin to a hazelnut.

Myxomata.—This form of tumor is met with somewhat rarely.

The growths locate themselves invariably upon the vocal cords, and may consist of a myxomatous degeneration, as it were, of the mucous membrane, giving rise to a sessile growth, or they may assume the form of a pedunculated multilobular growth. In some instances, they seem to present the ordinary smooth surface and gelatinous aspect of the myxomatous tumors met with in other parts of the air tract, while in others the surface is mammillated, of a grayish-pink color, and closely resembles a papilloma, from which indeed they can be distinguished only by microscopic examination.

In most cases they are unilateral, although both cords may be invaded.

Pathologically they are identical with similar growths in other portions of the air tract, being composed of loosely interlacing fibres of connective tissue holding within its meshes branching myxomatous cells.

Angiomata.—Vascular tumors in the larynx have been reported by a number of observers. In the majority of cases, they spring from the vocal cord, although instances have been recorded in which their origin was in the ventricular bands, the epiglottis, the hyoid fossa, and the lingual sinus. They vary in size from a pea to a hazelnut, and are composed, as are similar tumors in other regions, of a mass of blood-vessels held together by loose bands of connective tissue. The cases reported have all occurred in adult life, and confined themselves to one side, except in one case.

Chondromata.—Instances of this form of growth have been occasionally observed. It is characteristic of a cartilaginous growth springing from one of the laryngeal cartilages that it extends inward, giving rise to a sessile and immovable mass, which attains a considerable size, thus encroaching notably upon the breathing-space and causing dyspnœic symptoms. Its favorite point of development is in the cricoid cartilage; next in the order of frequency it arises from the thyroid, the epiglottic, and the arytenoid cartilages.

They are usually sessile in character, irregular in outline, and covered with slightly hyperæmic mucous membrane, and when subjected to attrition the surface becomes eroded. They occur usually in adult life, and develop very slowly. They are composed purely of hyaline cartilage, excepting when they spring from the epiglottis, when there is a more or less copious admixture of fibrous tissue. In one of Boecker's cases, a patient aged sixty-two, the tumor had undergone a certain amount of ossification. They vary from the size of a cherry-pit to a mass more or less completely filling the laryngeal cavity.

Adenomata.—It is somewhat doubtful if this form of neoplasm ever occurs in the larynx.

Lipomata.—The development of fatty tumors in the larynx is confined, with the single exception of a case reported by Burns, to those cases in which the growths, taking their origin in the aryepiglottic fold, fall externally into the hyoid fossa, where they oftentimes attain considerable size.

It is to be understood that in describing the various forms of neoplasm which occur in the larynx we have classified them under the head of the prevailing histological element which enters into their composition. Growths in the larynx, however, follow the same rule which governs the development of tumors in other parts of the body,

FIG. 161.—Papilloma of Right Ventricular Band.

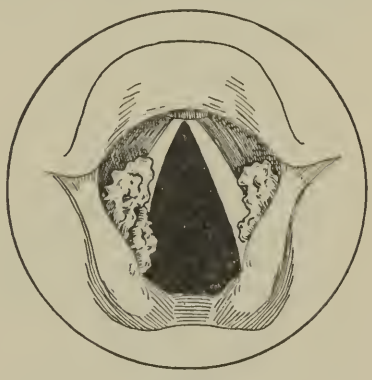

FIG. 162.—Papilloma of Ventricular Bands.

and we not infrequently meet with cases in which other tissues are more or less copiously mingled with the prevailing type.

DIAGNOSIS.—A *papilloma* is soft in consistency, is movable to a limited extent in the acts of inspiration and phonation, presents a grayish-white or pinkish-white color, is minutely mammillated or wart-like in contour, and usually springs from the anterior portion or angle of the vocal cords. The only growth with which it need be confounded, probably, is epithelioma in its early stages, and in such cases the age of the patient will aid us in forming a correct opinion.

A *fibroma* presents the appearance of a hard resisting mass, with a rounded or irregularly nodulated contour, and is covered with a mucous membrane, more or less highly injected. It is usually sessile in character, and deeply embedded in the surrounding tissues. It springs almost invariably from the anterior portion of the vocal cords. It may resemble either a cystoma or chondroma. The latter, however, never develops upon the vocal cords, while the cystoma is soft,

compressible, usually movable, and liable to be pedunculated. It moreover presents a semi-translucent aspect. A gummy tumor of the cords might present appearances suggestive of fibroma, and yet the progress and clinical history of the former should aid in establishing the diagnosis.

A *cystoma* is a small, soft, compressible growth, usually pedunculated, of a pinkish-white or grayish-white color, according to its location. Thus, on the cords it usually forms an almost translucent sac, while when it springs from the parts above, as from the arytenoid commissure or epiglottis, its surface is more or less vascular, giving it a reddish tinge and rendering it somewhat opaque. The character of the growth is easily determined by the probe, or by its collapse on seizure with the forceps.

A *chondroma* presents a hard, dense, resisting mass, of somewhat

FIG. 163.—Papilloma of Ventricular Bands completely filling the Vestibule of the Larynx.

FIG. 164.—Cystoma of the Epiglottis.

irregular outline, whose prominent characteristic is its exceeding slowness of development. It is covered by a healthy mucous membrane, and arises from any one of the laryngeal cartilages, although the cricoid is its favorite seat. In this latter situation it may be mistaken for a perichondritis or carcinoma. The former disease is characterized by the suddenness of its onset, the acuteness of the local inflammatory symptoms, and the early development of dyspnœa, while the subglottic origin of carcinoma is an exceedingly rare event. Moreover, the benign growth belongs to the earlier periods of life. A chondroma from one of the cartilages above the glottis presents something of the gross appearance of a fibroma. Its origin, as gathered from the clinical history, should suggest the character of the growth. Of course, the density of the tumor would easily distinguish it from the softer neoplasms, such as myxoma and cystoma.

Myxoma.—Myxoma in the larynx is of soft consistency and a grayish-white color. When, however, it is multiple, it presents appearances not unlike that of a papilloma. In these instances, the diagnosis can be clearly established only by removing a portion of the tumor and subjecting it to microscopic examination. The growth, moreover, as in papilloma, arises almost invariably from the vocal cords.

Angioma.—Angioma, constituting as it does a raspberry-like mass of highly injected blood-vessels, presents gross appearances which are unmistakable.

Prognosis.—These growths, as a rule, involve no dangers to life, except in those instances in which they attain such size as to encroach upon the normal breathing-space; and in such a case, of course a fatal tendency can be counteracted by the prompt performance of

Fig. 165.—Chondroma of the Epiglottis.

Fig. 166.—Angioma of the Left Ary-Epiglottic Fold.

tracheotomy. Ample warning, however, is always conveyed of any dangerous tendencies.

As a rule, the presence of the growth gives rise to no marked disturbance of the other portions of the larynx, either of an inflammatory, œdematous, or a neurotic character.

With our present methods of dealing with a neoplasm of the larynx, by the endo-laryngeal and extra-laryngeal operations, the prognosis as regards cure is practically always good. Papillomata alone show a marked tendency to recurrence. This is probably due to the fact that this variety of growth is generally subjected to the endo-laryngeal method of removal; hence, in those cases in which they have attained considerable size, it requires exceedingly nice manipulative skill to thoroughly extirpate the neoplasm without injury to the soft parts. It is probable, therefore, that the failure thoroughly to extirpate the

growth is in no small degree responsible for the recurrence when it takes place.

The prognosis as regards the complete restoration of the voice is generally good, although in some cases, in which the tumor has attained a large size, its extirpation is attended with a certain amount of injury to the healthy tissues which is liable permanently to impair the voice.

Spontaneous expulsion of the growth has been reported by some observers.

The possibility of a benign neoplasm undergoing malignant degeneration has been the subject of somewhat extended investigation, it having been claimed that a spontaneous tendency to this degeneration existed which was notably stimulated by the endo-laryngeal

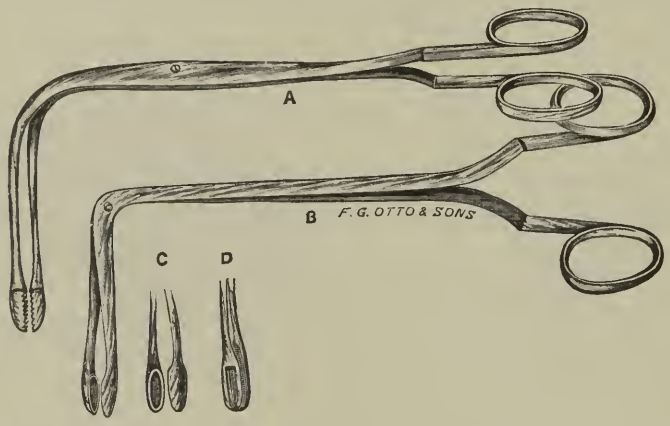

FIG. 167.—Mackenzie's Laryngeal Forceps.

methods of operating. It is thus found not only that the tendency to spontaneous degeneration is an exceedingly feeble one, but that this tendency is diminished by operative interference. It is scarcely necessary to add that this tendency largely confines itself to papillomatous growths.

TREATMENT.—Before the days of laryngoscopy, practically the only method of dealing with a neoplasm in the larynx, in those rare cases in which it was recognized, consisted in obtaining access to the laryngeal cavity by an external opening through the neck, although instances are recorded of successful operation through the natural passages, previous to the introduction of the laryngoscope.

After the larynx was brought under ocular inspection, the recognition of growths, even of small size, of course became an exceedingly simple procedure.

Various methods are employed for the extirpation of a neoplasm.

Evulsion consists in seizing the growth bodily, and tearing it from its site. This is accomplished either by means of the bladed forceps or by what is called the tube forceps. In Fig. 167 is shown the Mackenzie blade forceps, in which the blades are bent at a right angle. They are constructed to work either antero-posteriorly or laterally. Fauvel's forceps are very similar, with the exception that the blades are curved to a segment of a circle. My own preference is decidedly in favor of the Mackenzie instrument, owing to the fact that the angle at which it is bent adds notably to the facility of manipulation. As regards the direction of the blades, I quite agree with Fauvel in regarding the lateral movement as oftentimes of considerable advantage, in that the view of the parts is less obstructed than in the antero-posterior movement; the blades of Fauvel's instrument, moreover, are fenestrated for the same purpose. As accomplishing the same purpose, various forms of the tube have been devised. The objection to these instruments, as a rule, I think, is that they are not only too delicate in construction, but that the movements of the blades are somewhat limited, restricting their use to the smaller growths. The types of these are fairly well illustrated by Stoerk's instrument, in which the distal extremity of the tube is bent to the quadrant of a circle; and in Schroetter's instrument, in which the tube is curved both horizontally and vertically, in such a way that the handle is thrown to one side and beyond the line of vision. The latter instrument I regard as by far preferable for convenience of manipulation, although its use is somewhat restricted. The Mackenzie tube forceps I regard as entirely too slender for ordinary use.

Crushing the growths is accomplished by the same instruments which are used for evulsion.

Abscission consists in cutting through the base of the growth by means of a concealed knife or small scissors, such as the Stoerk and Schroetter instruments.

Écrasement is adapted only for those growths which project into the lumen of the larynx in such a way as will admit of the successful placing of a wire loop around their base. For this purpose, Schroetter's instrument or any ordinary snare may be used, the distal extremity being bent to a proper curve to suit the individual case.

The indications for excision by means of the guillotine are very similar to those for the use of the snare. The dislodgement of growths by means of the forcible introduction of a sponge probang into the larynx is recommended, and is especially suitable for small pedunculated growths attached near the edge of the vocal cords,

although ordinarily it would not be resorted to except in those cases in which tolerance of instruments is not easily secured on the part of the patient.

Destruction of growths in the larynx may be accomplished by either the chemical or potential cautery. Of the chemical agents, I much prefer the use of chromic acid to any other caustic. This may be fused on the end of a properly curved probe; or, in order to protect the healthy tissues, a hooded porte-caustique may be used. A very simple device is to wrap a large pledget of cotton firmly on the end of the laryngeal probang and then place a saturated solution of the chromic acid on that portion of the pledget which will impinge directly on that part of the growth which it is desired to destroy. Nitrate of silver I regard as inefficient, while the more powerful caustics, such as caustic potash, Vienna paste, and nitric acid, should never be used in the larynx.

The use of the galvano-cautery in the larynx possesses this great advantage, that the electrode can be placed *in situ* before the heat is developed in the platinum tip, and the current opened again before withdrawing the instrument, thus restricting its action entirely to the point which it is desired to cauterize. Hence, in those cases in which the milder chemical agent is inefficient, we possess no method of destroying laryngeal neoplasms comparable to it. The size and shape of the electrode should be adapted to the character of the growth with which we have to deal, although in most instances it will be wiser to use the smaller-sized platinum tips, and to nicely adjust the strength of the current to the proper heating power.

For the purpose of local anæsthesia, a twenty-per-cent solution of cocaine should be applied freely to the fauces and the larynx by means of the spray, and the action of the drug tested at the end of from three to four minutes, by passing a pledget of cotton, saturated with the solution, into the laryngeal cavity.

It is to be borne in mind that local anæsthesia does not secure amenity from reflex contraction of the faucial muscles; hence, when the membrane is rendered completely insensible, the operation may be hampered by involuntary muscular contractions of the fauces. This can be to a certain extent controlled by having the patient swallow some small pellets of ice during the intervals between the cocaine applications.

The first step consists in bringing the neoplasm into view; as soon as this is accomplished, the forceps (being previously warmed) is grasped firmly in the right hand, and the beak of the instrument passed directly into the fauces, until it nearly reaches the pharyngeal wall, after which it is carried down into the larynx. This should be

accomplished without impinging in any way upon the walls of the pharynx or larynx. As the beak of the instrument is passed downward and approaches the growth, it comes into view in the laryngeal mirror, after which its further movements are easily directed by the eye.

If the growth is supraglottic, immediately before the beak of the forceps is turned toward the laryngeal cavity, the patient should be directed to take a full inspiration, and follow this by the utterance of a high-pitched prolonged "A," thus securing the fullest elevation of the epiglottis and the widest exposure of the laryngeal cavity, and at the same time to an extent diverting the attention of the patient. In some instances, the seizure of the growth may be best accomplished during either expiration or inspiration, although the phonatory position of the larynx will prove most favorable in the majority of cases.

It is to be remembered that the depth of the larynx varies greatly in different individuals; it is therefore of importance that the descending portions of the blades should be of such length that the growth can be reached without the shaft of the instrument impinging upon the epiglottis.

It is scarcely necessary to add that the forceps should be introduced closed, and opened only at the moment the growth is to be seized.

I know of no operation in the throat which requires greater dexterity than the removal of a growth by the endo-laryngeal method.

A very small-sized papilloma is probably best removed by the Schroetter tube forceps; for the larger growths, I think most operators will give decided preference to the stout Mackenzie or Fauvel bladed forceps. These large growths are rarely removed at one sitting, but are taken piecemeal at intervals of from three or four days to a week, according to the tolerance of the patient and the traumatism which accompanies the operation.

Fibromas which project prominently into the laryngeal cavity are probably best removed by means of the snare, while those which are deeply embedded are most easily reached by the cutting forceps or curette. It is probably wiser, in the case of small fibromas, which are deeply embedded and inaccessible, to let them alone, for any attempt at operation is liable to do injury to the parts, while the mere existence of the growth itself involves no special danger to life, and the possibility of restoring the impaired vocal function is exceedingly doubtful.

Cystomas disappear promptly upon evacuation of the sac contents by the use of the concealed or naked knife.

Myxomata, whether sessile or pedunculated, should be seized and torn away by the bladed forceps.

If an angioma is so located as to admit of the use of the wire loop, this should be employed in preference to evulsion by any form of forceps, for, whereas the tumor is soft and easily torn away, there is no little danger of exciting troublesome hemorrhage. The danger of hemorrhage is not entirely obviated by the use of the snare, and it becomes a question whether the growth might not be destroyed by the galvano-cautery with more safety to the patient; or, in case the tumor has attained a large size, probably thyrotomy would be the more judicious procedure, either with or without a preliminary tracheotomy.

Enchondromata of small size may be successfully dealt with by cauterization; the larger growths, however, as a rule, will demand thyrotomy.

After the removal of a laryngeal tumor, a certain amount of after-treatment is generally necessary, both to destroy small fragments that may be left after evulsion or other methods of removal, or to prevent recurrence, this latter having mainly to do with papillomata. This consists in the application of caustics at intervals of a week or longer. For this purpose, probably no agent is more efficient than chromic acid, fused on the end of a delicate probe, after the manner already described.

If more active measures for destruction are indicated, the galvano-cautery may be used. For those growths which cannot be destroyed or extirpated by endo-laryngeal methods, it will become necessary to obtain direct access to the tumor by an external opening into the larynx. The operations which have been done for this purpose are thyrotomy, subhyoid pharyngotomy, and infrathyroid laryngotomy. These operations are described in a later chapter.

Before closing this discussion, I cite in full certain propositions laid down by Browne as follows:

First. Attempts at removal of growths from within the larynx are not in themselves so innocuous as is generally believed; but, on the contrary, direct injury to the healthy parts of the larynx, leading to even fatal results, is by no means of infrequent occurrence.

Second. The functional symptoms occasioned by benign growths in the larynx are in a large proportion of cases not sufficiently grave to warrant instrumental interference.

Third. Many of these new formations will disappear or be reduced by appropriate local and constitutional medical treatment, especially when of recent occurrence.

Fourth. Recurrence of laryngeal growths after removal *per vias naturales* is much more frequent than is generally supposed.

Fifth. While primary malignant or cancerous growths are of rare occurrence within the larynx, benign growths occasionally assume a malignant and even cancerous character, by the irritation produced by attempts at removal.

Sixth. The instruments now most generally in use are far more dangerous than those formerly employed.

Seventh. The cardinal law that an extra-laryngeal method ought never to be adopted unless there be danger to life from suffocation or dysphagia should be applied with equal force to intra-laryngeal operations, and it is a subject worthy of consideration whether in many cases tracheotomy alone might not be more frequently performed—first, with a view of placing the patient in safety when dangerous symptoms are present; second, in order that the larynx may have complete functional rest; and third, as a preliminary to further treatment, radical or palliative.

These statements seem somewhat radical, and while they cannot be fully indorsed, yet, coming as they do from so accomplished a writer and authority, they are not only worthy of consideration, but carry so much of suggestion that I simply quote them without further comment.

CHAPTER XCIII.

SARCOMA OF THE LARYNX.

It is only within comparatively recent times that any close distinction has been drawn between the two forms of malignant disease in the larynx, sarcoma and carcinoma. This we can easily understand when we consider the fact that the clinical history and prognosis are much the same in both forms of disease.

Sarcoma is to be regarded as of exceedingly rare occurrence in the larynx. This is indicated by the fact that it stands in the proportion of 1 to 62 of carcinoma.

Etiology.—Our conclusions are based on an analysis of 47 cases, which are recorded in medical literature. Of these, 34 occurred in males and but 13 in females. As regards age, 1 occurred in the second decade of life, or between ten and twenty; 4 in the third, 7 in the fourth, 9 in the fifth, 11 in the sixth, 6 in the seventh, and 2 in the eighth; the youngest of these patients being a female aged nineteen and the oldest being seventy-four. As a rule, the affection develops without any apparent cause and in patients enjoying good health. One case, however, seems to have developed from a simple papilloma of the larynx.

Pathology.—The histological character of the growth differs in no essential degree from sarcomas found in other portions of the body.

The disease originated in the vocal cords in 16 cases, in the ventricular bands in 9, in the right ventricle in 2, in the epiglottis in 5, and in the right pyriform sinus in 1. In 2 cases the origin of the growth was subglottic.

In most instances the growth seems to confine itself to the laryngeal cavity, and, when an extension occurs, the tendency is downward. In cases recorded the disease started in the tonsil and pharynx, in the commissure. In one unique case it invaded the larynx, pharynx, soft palate, and base of the tongue. As a rule, the disease is not only unilateral in this region, but tends to remain so.

Symptomatology.—The earliest symptom is impairment of voice, giving rise to either hoarseness or complete aphonia, while, as the air spaces are encroached upon, interference with respiration sets in.

There is generally more or less secretion from the surface of the growth; hence, cough is usually present. This is rarely a persistent or distressing symptom, except when the tumor extends below the glottis. If the growth extends upward and involves the epiglottis or the parts above, dysphagia is liable to occur.

Pain is rarely present. Erosion or ulceration is liable to occur quite early in its history, in which case the sputa may be tinged with blood, though I know of no instance in which grave hemorrhage has occurred.

The rapidity of growth seems to vary notably in different cases. In one case it filled the larynx in two months, and in another in four months.

The tendency to generalization is exceedingly feeble, as shown by the fact that the cervical glands are very rarely the seat of secondary infiltration. In but a single instance reported has this tendency to generalization extended farther than the cervical glands. In this instance there was metastatic involvement of the lungs, liver, and brain, death occurring from these complications three months after the primary invasion of the larynx.

In many instances a form of cancerous cachexia seems to set in. This, however, rarely presents the prominent features of the carcinomatous cachexia.

Diagnosis.—These growths present an irregularly rounded outline, sometimes of a pinkish but generally of a grayish, semi-opaque color. They are soft in consistency, and their general aspect is perhaps best described by the term "grumous."

We have no definite means of distinguishing by gross inspection between a sarcoma and a carcinoma.

The differential diagnosis can best be established by submitting a portion of the growth to a microscopic examination.

Prognosis.—The disease is an exceedingly fatal one, and only less so than carcinoma of the larynx. Of the 47 cases which I have collected, the histories are incomplete in most instances. In 18 death is recorded, and in 13 the report is complete, from which it is shown that the average duration of life from the onset of the symptoms was nineteen and one-quarter months.

Treatment.—An analysis of the cases operated upon indicates that extirpation may occasionally prove successful. Instances are recorded in which recurrence has not taken place.

No suggestions can be made as to the selection of an operation in any given case, as in each instance this decision must be based entirely on the duration of the disease and the size and location of the growth. In the early stages, while the tumor is small, it will be best

to attempt to remove it through the natural passages; if this fail, thyrotomy should be resorted to.

Resection or complete extirpation of the larynx becomes imperative, unless specially contraindicated by the general condition of the patient, when the simple operations have failed to remove the disease.

CHAPTER XCIV.

CARCINOMA OF THE LARYNX.

The rarity of carcinomatous invasion of the larynx is shown by a report of 11,131 cases of carcinoma in three of the large hospitals of Vienna; in these the larynx was invaded in 63. Lébert, in 9,118 cases of cancer, found this organ affected in but 3 cases; Winniwarter, out of 548 cases, found 1 case of laryngeal cancer; and Baker finds the larynx affected 3 times in 500 cases.

Etiology.—Heredity exercises the same important influence in laryngeal cancer as in other regions of the body. This is traceable in from twenty to twenty-five per cent of the cases reported.

It is much more frequent in the male than in the female, and belongs essentially to the late years of life.

Occasionally a patient traces the origin of the disease to some over-use or strain of the voice, or perhaps to an attack of laryngeal catarrh. It would seem probable that these symptoms are really due to the onset of the malignant affection.

Pathology.— The histological characters of laryngeal cancer do not differ from those of cancer in other portions of the body. By far the most frequent variety in this region is epithelioma.

Cancerous growths may spring from any portion of the larynx, though the ventricular bands are most often affected.

It is a well-known fact that primary cancer of the larynx, so long as it confines itself within the cavity, shows little tendency to involve the lymphatic glands of the neck. As a rule, intrinsic cancer, so long as it confines itself to the laryngeal cavity, does not affect the lymphatic glands of the neck. Extrinsic cancer, that affecting the epiglottis, ary-epiglottic folds, or the arytenoids, may extend to the glands at a comparatively early period.

The investigations of Sappey have shown that the lymphatic vessels in the superior portion of the larynx are multiplied to infinity, forming a close network covering the epiglottis and stretching toward the ary-epiglottic folds. As it reaches the ventricular bands and lower portions of the larynx, it becomes more and more attenuated. This attenuation, moreover, is more evident with advanced age. Herein, I think, lies an explanation of the fact that malignant disease

in the intrinsic or lower portion of the larynx fails in so many cases to result in involvement of the cervical lymphatics.

Symptomatology.—There is nothing in the development of a laryngeal cancer which gives rise to symptoms differing in any marked degree from those which characterize the onset of a benign growth. Vocal impairment is the first symptom which manifests itself, and even this may be absent for a considerable period, especially in those cases which commence in the ventricular bands. As the tumor increases in size, the voice becomes weaker and is finally almost completely lost. The next symptom is dyspnœa, as the growth encroaches upon the breathing-space. In extrinsic cancer, dysphagia may develop, owing, in the early stages, to the mechanical obstruction of the food tract by the growth. As the direct result, probably of this latter symptom, salivation becomes a prominent symptom in many cases.

Glandular enlargement, if present, occurs somewhat early in the history of the case. In the course of from three to six months, the subjective symptoms become more prominent, and ulceration and hemorrhage appear. The ulceration not only involves the superficial parts of the tumor, but forms fissured or crater-like excavations, the result of interstitial necrosis. This is especially characteristic of encephaloid cancer. In epithelioma, on the other hand, the ulceration is more superficial in character.

Before ulceration occurs the secretion consists merely of a slight excess of healthy mucus, the accumulation of which in the larynx may give rise to slight irritation and cough. After ulceration sets in the secretion becomes somewhat excessive, and consists of a thin seromucus, more or less freely surcharged with pus cells and necrotic tissue. It is of a grayish-yellow color and somewhat unhealthy aspect. At the same time the patient's breath is apt to be exceedingly offensive, the fetor having a peculiar musty smell.

Hemorrhage occurs in consequence of the ulceration, and may be very slight, simply tinging the sputa; or, as the result of an erosion of one of the arterial twigs, may be very frequent. But one case of fatal hemorrhage from a laryngeal cancer, however, so far as I know, has been reported.

Pain is a somewhat constant symptom, although in rare instances entirely absent. It is more characteristic and more prominent in extrinsic cancer. It is of a sharp, lancinating character, and usually radiates toward the ear, although it may extend over the whole side of the neck.

The cancerous cachexia is longer delayed in the laryngeal form of the disease, and in many instances is entirely absent.

Diagnosis.—A definite diagnosis cannot be made in the early stages of the disease. The disease consists essentially in a cell infiltration, which burrows, broadly and deeply, into surrounding parts. Hence, the defined tumefaction by no means shows the whole extent of the diseased action. As the result of the deeper infiltration, extending to the muscles and perhaps to the articulations, the normal motility of the parts is liable to be seriously impaired, even at a comparatively early stage of the disease. In the later stages of the disease, the diagnosis is comparatively easy: the prominent features are the broadly infiltrating, irregular mass which fills the laryngeal cavity, the complete distortion of the parts, the extensive ulceration, the peculiar character of the secretion, and the fetid odor. These, taken in connection with the age of the patient, the enlargement of the cervical glands (if such be present), the progressive development of symptoms, together with the lancinating pains radiating toward the ear, and the cachexia in the very late stage, enable one to recognize the true character of the disease beyond much question of doubt.

Prognosis.—Cancer in any region of the body is not only one of the most fatal, but one of the most distressing of diseases, and is rendered more so when occurring in the larynx, in that it interferes with respiration. Fauvel reports that in seven cases of encephaloid cancer of the larynx not operated upon the average duration of life was three years; and in six cases of epithelioma not operated upon the average duration of life was one year and eleven months. It would seem, therefore, that it is not more rapidly fatal than cancer in the other portions of the body, with the exception of those involving the muscular connective tissue and the lymphatic tissues. It would be a fair inference that a cancer of the larynx would result in death from suffocation in a comparatively short period. We reach the conclusion, therefore, that for some reason the growth develops more slowly in this region, or else that the early ulceration results in such a loss of tissue that a sufficient patency of the air passages is maintained to admit of respiration for a longer period.

Treatment.—There are certain general and local measures to be resorted to in the treatment of cancer of the larynx which mitigate in a marked way the suffering which this disease entails. These measures, in brief, consist in the local application, by means of sprays or in the form of powders, of anodynes and disinfectants.

For the latter purpose, we may use a twenty-per-cent solution of peroxide of hydrogen, a one-half-per-cent solution of pyoktannin, a two-per-cent solution of permanganate of potash, or one of the carbolized alkaline solutions, the formulæ of which have already been given, although, for the correction of the fetor which attends cancer-

ous ulceration, no remedy probably is better than iodoform or iodol, preferably the former.

For the local anodyne effect, we may use morphine, either in powder or in solution. The action of morphine, while more permanent, is by no means so efficient as cocaine. A five- to ten-per-cent solution of this latter drug may safely be entrusted to the patient for use by means of a suitable atomizer, as often as may be necessary.

Liegeois reports a case in which a carcinoma of the larynx was apparently rendered stationary for twenty-six months by the daily internal administration of fifteen drops of tincture of thuja occidentalis, together with local applications of the same drug.

Tracheotomy, of course, is merely a palliative resort, and should be performed promptly upon the supervention of dyspnœic symptoms. Fauvel found that this operation prolonged life nine months in encephaloid disease, and over two years in epithelioma.

The radical measures of treatment embrace the use of caustics, endo-laryngeal operations, thyrotomy, resection, and extirpation of the larynx.

The use of either the chemical or potential cautery should be condemned on every ground.

The removal of a malignant growth by the endo-laryngeal method would commend itself by its simplicity, and yet there is but a single case on record in which this method has been successful.

In a compilation of twenty-two cases of thyrotomy, made by Mackenzie, a successful result was obtained in two cases, both being operated on by Billroth, one of carcinoma and the other of epithelioma. To these should be added two cases operated upon by Butlin, in which, endo-laryngeal methods failing, thyrotomy was done.

As regards resection or partial extirpation of the larynx, Mackenzie has collated thirty-five cases in which this operation was done. Of these patients, six were well at the end of from twelve to eighteen months, while one was well nearly three years after the operation.

Coming now to the most radical operation, viz., the total extirpation of the larynx, we find, according to Mackenzie, that practically the whole of the larynx has been removed in one hundred and thirty-eight cases. Of these patients one hundred died or had a recurrence. Of the remainder, the history of some is imperfect, but it is safe to infer that thirteen, or ten per cent, recovered.

Thyrotomy can be performed with any hope of success only at an early period of the disease, and before the deep tissues and cartilages had been infiltrated.' Resection, of course, is indicated only in those cases in which the disease still confines itself to one side of the lar-

ynx, while total extirpation becomes necessary only when the whole cavity is invaded.

When we consider the exceeding fatality of the affection, and the feebleness and uncertainty of our remedial measures, we must acknowledge that there are few questions presented to the surgeon which are more difficult of decision than those with which he is confronted in a case of laryngeal cancer.

In any case of neoplasm in a patient past middle life, which shows any marked disposition to recurrence, and especially if the microscope reveals any tendency to epithelial formation, there can be no question of the wisdom of performing thyrotomy and thoroughly extirpating every portion of the tumor. If, upon this, recurrence takes place, a resection of the larynx should be promptly made while the disease is still confined to one side of the larynx. No question should be entertained in regard to the advisability of this operation, when we consider the successful results which have attended it and the limited danger to life which it involves, compared with complete extirpation.

There are two questions to be considered always in these cases: the arrest of the disease and the comfort of the patient while life lasts. While, therefore, the resection may not completely eradicate the disease, and recurrence will probably take place, it must be borne in mind that we have by the operation added many months of comparative comfort to the life of the patient.

When recurrence takes place after resection, the further question of total extirpation of the organ is one that can be decided only according to the special indications in each particular case, or perhaps according to the wishes of the patient.

SECTION VI.

EXTERNAL SURGERY OF THE THROAT.

EXTERNAL SURGERY OF THE THROAT.

Under this heading we discuss the various surgical procedures which are performed for the purpose of obtaining access to the pharynx, larynx, and trachea, and which necessitate cutaneous incision.

CHAPTER XCV.

PHARYNGOTOMY.

In the very large majority of cases, when the removal of a tumor or a foreign body from the pharynx becomes necessary, access sufficient for manipulative purposes is afforded through the natural passages. When a wide opening is required, it is a well-recognized surgical procedure, which involves no serious complications, to enlarge the oral opening by an incision through the cheek, extending from the angle of the mouth to the anterior border of the masseter muscle. When tumors are of large size and extensive attachments, one of the more complicated operations will become necessary.

Subhyoid Pharyngotomy. (*See colored plate.*)

This operation is particularly indicated in growths situated low down on the pharyngeal wall, and may be resorted to in supraglottic tumors of the larynx not easily removable through the natural passages. It affords a free and direct approach to the lower portion of the pharynx, and yet the laryngeal mirror renders this region quite accessible for examination and manipulation. It is only those cases of benign tumors, therefore, which involve unusual difficulties of manipulation which call for the external incision, such as a broadly sessile growth, perhaps, or one whose base encroaches upon the orifice of the œsophagus. A malignant growth also may necessitate the wider access and more direct manipulation which this operation affords. It may also be indicated for growths in the pyriform sinuses.

The Operation.—The patient should be placed on a table, with the shoulders elevated, as in tracheotomy, the head being bent backward as far as possible. A transverse incision through the integument is made about one-third of an inch below the lower border of the hyoid bone, extending from the anterior border of the sterno-mastoid muscle on one side to a similar point on the opposite side (see Fig. 168). Beneath the skin we come upon the superficial fascia, in which courses the anterior and occasionally the external jugular veins. These are to be included between two double ligatures, and severed. Beneath the superficial fascia the sterno-hyoid muscles are met with

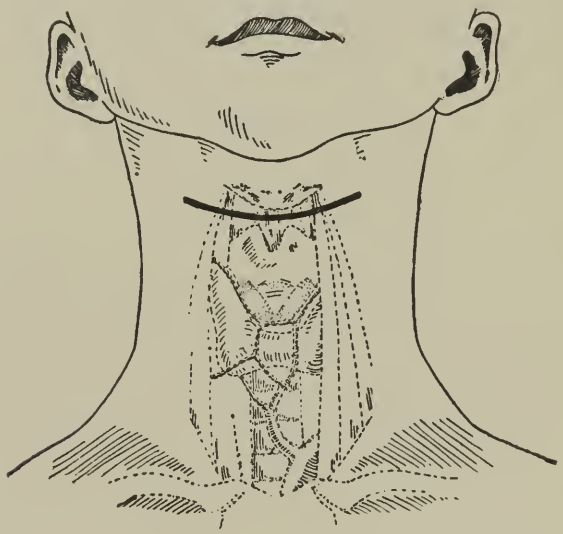

FIG. 168.—The Cutaneous Incision in Subhyoid Pharyngotomy, and the Relation of the Deeper Parts.

in the median line, one on either side, and cut through, and, beneath, the thyro-hyoid muscles, which are treated in the same manner. The thyro-hyoid membrane is then reached, dense in the median line but becoming more attenuated laterally. The wound should be now explored by the thumb and index finger, and the attempt made to ascertain the position of the epiglottis. When this is found, the thyro-hyoid membrane and the pharyngeal mucous membrane which is beneath it should be incised at the side of the epiglottis, and the incision carried directly through to the opposite side, care being taken to avoid wounding either the epiglottis or its attachments. The crest of the epiglottis is now seized and drawn out through the wound, when a stout thread should be passed through it and a loop formed; it is then drawn downward and forward by an assistant in such a way

as to leave wide and free access to the pharyngeal cavity. If now, on direct examination and palpation of the growth which has called for the operation, it is found to extend downward into the œsophagus, a special advantage of the procedure lies in the fact that more space can be gained by extending the end of the incision on one or the other side down along the border of the sterno-mastoid muscle, in such a way as to convert the procedure practically into a lateral pharyngotomy, or, more correctly perhaps, an œsophagotomy.

After the growth has been removed, the wound is closed by inserting catgut sutures into the thyro-hyoid membrane and the severed

Fig. 169.—Line of Cutaneous Incision in Lateral Pharyngotomy (Langenbeck's Method).

muscles, and finally bringing together the cutaneous flaps and treating them in a similar manner.

The patient should now be restricted to rectal alimentation for at least forty-eight hours.

Lateral Pharyngotomy. (*See colored plate.*)

Langenbeck's Method.—A curved incision (see Fig. 169) is made through the integument, which, commencing at the lower border of the inferior maxilla, midway between the chin and angle, then passes downward to the superior cornu of the hyoid bone, and along the anterior border of the sterno-mastoid muscle to a point opposite the cri-

coid ring, or lower if necessary. Immediately beneath the integument the platysma muscle, lying in the superficial fascia, is divided. Beneath this is found the deep cervical fascia, which is to be incised with some care, especially in the upper portion, where important vessels and nerves may be encountered. In the lower portion of the wound, however, the only vessel which may be met with is the superior thyroid; this should be avoided, while the sheath of the great vessels is retracted. Beneath the deep fascia in the upper portion of the wound the submaxillary gland is seen and pushed to one side, when the hyo-glossus muscle comes into view and is severed, and the

Fig. 170.—Line of Cutaneous Incision in Lateral Pharyngotomy (Bergmann's Method).

lingual artery, which courses beneath it, sought for and ligated. After this, the stylo-hyoid and digastric muscles are severed and the greater cornu of the hyoid bone is found, beneath which lies the pharyngeal aponeurosis, which being incised, with the mucous membrane beneath it, the pharyngeal cavity is reached. When the pharynx is opened, the incisions through its lateral wall may be extended as far up as the base of the tongue and down to the orifice of the œsophagus, thus obtaining a wide access to this region for the carrying out of the indications for which the operation is done. This method is especially valuable for the removal of tumors involving the lower portion of the pharynx and even extending into the œsophagus,

in that this latter structure can be opened through a considerable portion of its upper extremity. Moreover, by strongly retracting the anterior flap, the posterior wall of the larynx is brought thoroughly within reach; and when this has been invaded by the morbid process its resection is easily accomplished.

Bergmann's Method.—A curved incision, with its convexity outward (see Fig. 170), is carried backward from the angle of the mouth, across a point near the angle of the jaw, and downward over the superior cornu of the hyoid bone and along the anterior border of the sterno-mastoid muscle to a point opposite the thyroid cartilage, or

Fig. 171.—Line of Cutaneous Incision in Lateral Pharyngotomy (Küster's Method).

lower if necessary. After the integument and superficial fascia are cut through, the facial artery should be sought for and ligated, after which, the muscles of the cheek being divided, the lower portion of the wound is deepened and the lingual artery ligated in the manner already described in Langenbeck's operation. The ramus of the jaw is now sawn through in the line of the cutaneous incision. The mucous membrane is then incised from the angle of the mouth backward and downward to the pharyngeal cavity. In this manner a wide and continuous access is obtained to the whole of the cavity of the mouth and pharynx as far as the laryngeal orifice.

Küster's Method.—A cutaneous incision, commencing at the an-

gle of the mouth, was carried backward across the angle of the jaw to the anterior border of the sterno-mastoid muscle (see Fig. 171). The cheek was completely cut through, some small branches of the facial artery being encountered and ligated; the ramus of the jaw was then exposed and sawed through in the line of the incision. The upper fragment was then disarticulated and removed. The incision was carried through the mucous membrane back as far as the border of the sterno-mastoid muscle. By depressing the jaw and retracting the

FIG. 172.—Line of Cutaneous Incision in Lateral Pharyngotomy (Mickulicz's Method).

upper flap, abundant access was obtained to the faucial region and cavity of the pharynx.

The same surgeon suggests that, in case the disease extends downward toward the œsophagus, the horizontal incision might be made from the corner of the mouth to the angle of the jaw and then continued vertically downward to the border of the sterno-mastoid muscle, the upper fragment of the jaw being removed in the same manner as in his first operation.

MICKULICZ'S METHOD.—In this operation an incision is made through the integument of the side of the neck, extending from the mastoid process along the anterior border of the sterno-mastoid muscle down as far as the thyroid cartilage (see Fig. 172). The integu-

ment and superficial fascia being cut through, the deep fascia is reached, after which the dissection should be made with exceeding great care. Beneath this we come upon the great vessels, which are to be retracted. The facial artery should now be sought for and ligated, and the hypoglossal nerve carefully avoided. The anterior flap is retracted, and the angle of the jaw sought for and cleared. The periosteum of the ascending ramus is carefully separated, care being taken to preserve the insertion of the pterygoid muscles. The ramus is then sawn through and disarticulated. The lower portion of the incision is now deepened, the posterior belly of the digastric

Fig. 173.—Line of Cutaneous Incision in Lateral Pharyngotomy (Cheever's Method).

muscle divided, the stylo-hyoid drawn forward, and the lateral wall of the pharynx thus reached, which is now opened in its whole extent from a point opposite the soft palate down as far as the œsophageal entrance, if necessary.

Cheever's Method.—In a case of encephaloid tumor of the tonsil, this operator opened the pharynx after the manner already described in Mickulicz's operation, with the exception that the ramus of the jaw was not resected and a little wider retraction of the flaps was obtained by making, in addition to the longitudinal cutaneous incision, a horizontal incision extending forward along the body of the inferior maxilla (see Fig. 173).

In a second case operated upon by the same surgeon, the incision was carried from the angle of the mouth backward in a straight line across the ramus of the jaw to the anterior border of the sterno-mastoid muscle. The ramus was then sawed through and the fragments separated. An incision was then made through the mucous membrane, extending backward through the whole extent of the cutaneous incision.

Polaillon's Method.—This surgeon, in order to gain access to a malignant tumor of the tonsil, incised the cheek from the angle of the

Fig. 174.—Line of Cutaneous Incision in Lateral Pharyngotomy (Polaillon's Method).

mouth backward, and extended his cutaneous incision across the inferior maxilla as far as the anterior border of the sterno-mastoid muscle. A segment of the ascending ramus of the jaw was excised, and then the cutaneous incision was extended downward along the anterior border of the sterno-mastoid muscle (see Fig. 174). The incision through the mucous membrane thus extended from the mouth in a straight line to the pharyngeal wall and subsequently down to the orifice of the œsophagus.

CHAPTER XCVI.

THYROTOMY.

[*See colored plate.*]

The infrequency of the resort to this procedure before the days of laryngoscopy is easily explained by the inability to make a definite diagnosis of intra-laryngeal conditions, and hence the failure to establish clear indications for opening the larynx.

Indications.—This operation is usually done for the removal of tumors in the cavity of the larynx; in rare instances it may be indicated in the cases of foreign bodies in this cavity, and possibly for cicatricial stenosis or other morbid conditions. Hope has suggested its availability for the purpose of removing a portion of the vocal cords in cases of abductor paralysis, to re-establish impeded respiration.

When a tumor can be thoroughly extirpated through the natural passages without involving any danger of permanent injury to the soft parts, there can be, of course, no question as to the propriety of such procedure. If the tumor is of large size and has a broad base, or if it is attached beneath the cords, or in any other position which renders it not easily within the reach of the laryngeal forceps, there should be no hesitancy in opening the larynx, in preference to subjecting the patient to the dangers which the intra-laryngeal method might entail.

The Operation.—The incision is made through the integument in the median line, extending from immediately above the thyroid notch to the cricoid ring. The integument being retracted and the small amount of areolar tissue which is found in this region being pushed aside by the handle of the scalpel, the thyroid cartilage is brought immediately into view. This should be thoroughly cleared and its extent in the median line recognized, both by the contour of the parts and the position of the thyroid notch, when with a stout sharp scalpel a superficial incision is made, extending throughout its whole length. This is slowly deepened by successive strokes of the knife until the mucous membrane is reached. In late adult life this cartilage is liable to be the seat of ossification, which will necessitate the

use of a small saw or the cutting forceps. The mucous membrane should be thoroughly exposed by a complete section of the cartilage before it is cut or the larynx penetrated, inasmuch as the irritation and hemorrhage are liable to cause a troublesome cough, by which subsequent manipulations may be hampered. The constant effort should be to confine the incisions exactly to the median line: this is of especial importance in incising the mucous membrane, for a deviation from the median line at this step of the operation would involve the wounding of one of the vocal cords. In order to avoid this, it is well to make the incision from below upward by means of a curved sharp-pointed bistoury, the fragments of the cartilage being held apart by means of hooks in the hands of an assistant. A short inci-

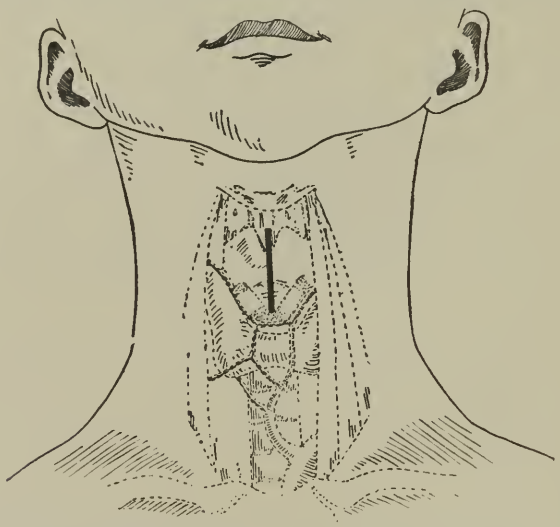

FIG. 175.—Cutaneous Incision in Thyrotomy, and its Relation to the Underlying Structures.

sion is made first, when the subglottic tissues and under surface of the vocal cords are brought into view, provided a strong light is used, and this operation should always be done, I think, with the aid of the concave forehead mirror. As soon as the vocal cords are seen, the knife can be so directed as to complete the incision of the mucous membrane directly between the anterior insertion of the cords. In making the cartilaginous section, it is well to leave a small portion of the cartilage at the upper extremity of the incision undivided, to provide for the more perfect coaptation of the parts after the completion of the operation. If a sufficiently roomy access to the laryngeal cavity is not obtained in this way, it may be necessary to complete the section, in order that the halves of the divided cartilage may be drawn farther apart.

As gaining still larger access, it may occasionally be wise to make a transverse incision through the crico-thyroid membrane at the lower border of the thyroid cartilage. When cutting in this region, of course, the position of the crico-thyroid artery crossing the upper portion of this membrane should always be borne in mind.

The cavity of the larynx being now opened, the neoplasm is brought into view and removed by such measures as may seem most suitable. Ordinarily, I think, the cold-wire snare, or for a very small growth the ordinary aural snare, should be resorted to, as securing the detachment of the tumor with the least amount of hemorrhage. I cannot agree with Mackenzie in considering this operation as "a very serious one as regards the danger to life," for in itself it involves no very grave menace to life, nor is it liable to be attended with grave complications. The most troublesome complication which may arise is that of hemorrhage. As a rule, this arises in the extirpation of the neoplasm, and not from the thyrotomy incisions. The hemorrhage which occurs at the time of the operation is not excessive, and usually can be controlled by pressure, or, if necessary, by ligatures. The slow trickling, or perhaps secondary hemorrhage, which occasionally occurs later, is liable to be more troublesome even than the primary bleeding. This is best controlled by thorough cauterization of the base of the tumor, either by the galvano-cautery, nitrate of silver, or chromic acid. Of these the former is probably the best hæmostatic, if used at a dull red heat.

It is by no means an easy matter in these operations, especially in young children, to thoroughly recognize the regional anatomy of the laryngeal cavity when opened in this manner. This is especially true while the neoplasm is in position. After the growth has been removed, however, the false cords and ventricular openings should be easily recognized. Perhaps as valuable a landmark as any will be found in the arytenoid cartilages, which when the growth is removed can be seen in the deepest portion of the opening, moving rhythmically with the respiratory act. Their recognition enables the operator more intelligently to explore the cavity, and to verify the success of the operation in the complete removal of every trace of neoplasm.

After the growth has been extirpated, the cartilaginous structures are brought again into as perfect apposition as is feasible, and secured in place by sutures. In a child these should be of silkworm gut, as they are to be left *in situ*. The integument is then brought together and secured above them.

The decision of the question of a preliminary tracheotomy is one which will be based largely upon the character of the affection

which calls for the thyrotomy. If the tumor is of small size, and presents a fair prospect of allowing of extirpation without much hemorrhage, it will probably be safe to open directly into the larynx without previously inserting a tracheal canula. In most instances, however, this latter procedure will be demanded, and whether absolutely necessary or not, it certainly adds much to the sense of security with which the surgeon will operate; moreover, his manipulation is notably aided by abolishing for the time being the respiratory function of the larynx, by temporarily establishing a new channel for the air current below.

I know of no good reason why the two operations should not be done at the same time, as the shock from both procedures combined can scarcely react on the general system to such an extent as seriously to complicate or imperil the ultimate result.

CHAPTER XCVII.

TRACHEOTOMY.

[*See colored plate.*]

We use the term tracheotomy, as a somewhat generic expression, to describe the various operations which are done for the relief of dyspnœa whether the immediate site of the incision be the laryngeal cartilages or the tracheal rings.

The Tube.—In the tubes formerly used, the movements of the neck caused the distal end of the tube to impinge upon the tracheal wall in such a way as to create no little irritation; this suggested the device in which the tube is attached to the cervical joint, by which this objection was obviated. Its mechanism, which is illustrated in Fig. 176, is generally known as Trousseau's.

An oval opening is ordinarily made on the upper side of the curved portion of the tube, opposite the lumen of the upper segment of the trachea; this is designed to admit the passage of air for respiratory purposes when the inner tube is withdrawn.

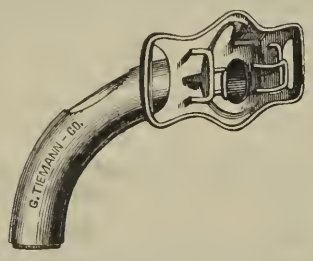

Fig. 176.—Trousseau's Tracheal Tube.

A very serious objection to this fenestra lies in the fact that the tissues are apt to pouch into the opening and become eroded; and in several instances I have seen exceedingly troublesome hemorrhages arise from this source. The object of the fenestra, of course, is to enable the patient by closing the mouth of the tube to force air through the larynx, either for phonatory purposes or to test the patency of this organ. Ordinarily there is sufficient space between the periphery of the tube and the tracheal wall to admit of this.

The ordinary tube is curved to the arc of a quadrant, and for this reason cannot adapt itself to the varying thickness of the cervical tissues. To obviate this difficulty, Durham has constructed the exceedingly ingenious device shown in Fig. 177. The improved feature of this tube consists in making that portion of it which lies in the wound straight, while the tracheal end is bent somewhat abruptly to a right

angle; at the same time, in order to adapt it to the varying depth of the trachea beneath the integument, it is so arranged that the position of the neck-plate can be changed, thus altering the length of that portion of the tube which is in the wound and adapting it for any special case. Of course this short curve in the tube demands that the inner canula, in order to permit of removal and insertion, shall be flexible. This is accomplished by constructing the tracheal end of the inner tube with lobster-tail joints, as shown in the figure. It is also supplied with a pilot trocar with a jointed extremity, to facilitate its introduction. Theoretically, Durham's tube is a great improvement on the ordinary form: its advantage lies in the fact that in the movements of deglutition the whole tube moves upward in the axis of the trachea, carrying with it the tracheal end, which is thus prevented from tilting against the posterior wall. The movable neck-plate renders it possible to adapt the tube nicely to the varying thickness of the cervical tissues, and to adjust its proximal opening to the axis of the trachea. The jointed inner canula presents crevices for the lodgment of mucus, hence it is somewhat liable to become clogged; there is also a danger that the segments may become detached and drop into the trachea. Moreover, the removal and reinsertion of the outer tube, after the wound in the neck has closed around it, is attended with a distention of the parts, which renders it necessary to crowd the tissues to such an extent that hemorrhages may be excited. With the Roget tube, by passing it exactly in the line of the circle of which it forms a quadrant, no lateral pressure whatever is exerted, and the tube is removed and reintroduced with perfect ease, and without causing pain or hemorrhage. With the Durham tube, on the other hand, which is passed through a straight opening until it reaches the trachea, its convexity crowds upon the upper wall, while its tracheal extremity scrapes along the floor of the wound till it reaches its position.

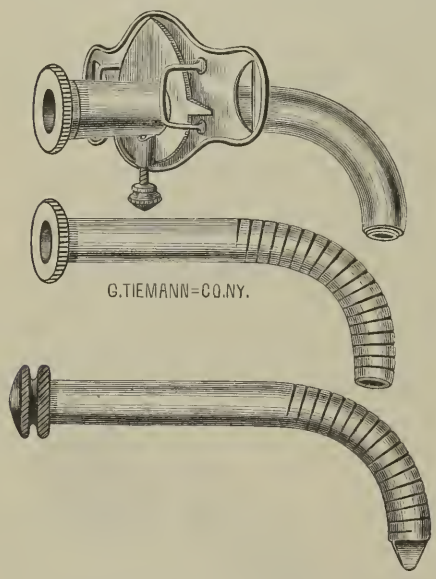

FIG. 177.—Durham's Tracheal Tube. Showing the lobster-tail inner tube and the pilot trocar.

Fuller has devised an instrument in which the outer tube consists

of two lateral convex plates attached firmly to the neck-plate. The supposed advantage of this device is that, by pressing the plates together, the point of the instrument is reduced to a minimum, thus facilitating its insertion into the tracheal opening. These plates are subsequently forced apart by the insertion of the inner tube. Gendron has devised a similar instrument, in which the lateral segments of the outer tube are separated by means of a screw fixed to the outer plate. These devices possess no especial advantages, and, moreover, the edges of the segments are liable to cause erosion of the tissues in the wound. In Fig. 178 is shown an instrument devised by Koenig, for cases in which the respiratory stenosis occurs low down in the trachea. The instrument is about four and a half inches long. The firmness and flexibility necessary for its introduction are secured by making its central portion of wire wound into close spiral.

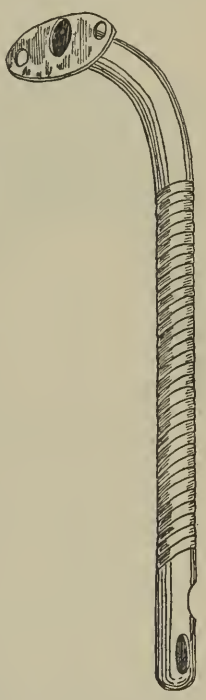

Fig. 178.—Koenig's Tube for the Relief of Tracheal Obstructions.

When tracheotomy has been done for a syphilitic stenosis or other chronic affection of the larynx, valves are occasionally fitted to the canula in such a way that, while inspiration is effected through the tracheal opening, the expiratory current is forced through the natural passages. In Fig. 179 is shown the Luer pea valve, which is fitted to the tracheal canula. During inspiration the ball is lifted away from the orifice of the tube, and the inspiratory current passes easily, while during expiration it falls into the outer opening, completely closing it, and thus forcing the air through the larynx.

Various devices have been constructed for rapid tracheotomy, on the principle of the canula and trocar. I do not think this method of operating is to be commended.

Tracheal canulas are constructed of silver, aluminum, and vulcanite. The metal tube should in all cases be preferred, for, while the vulcanite canula is cheaper, it is fragile and brittle, and there is always the danger of a fracture in the effort to withdraw an inner tube which has become fixed by dried mucus; moreover, the calibre of these tubes is not so large in proportion to the outer diameter as in the metal instruments.

As regards the tube to be used in any given case, the following table indicates the sizes admissible for the various ages:

For a child under three years the inner calibre of the tube should

be $\frac{3}{16}$ inch; from 3 to 6 years, $\frac{4}{16}$ inch; from 6 to 9 years, $\frac{5}{16}$ inch; from 9 to 12 years, $\frac{6}{16}$ inch; from 12 to 20 years, $\frac{7}{16}$ inch.

The largest-sized tube which is supplied by the instrument makers has a calibre of a half-inch. This is very rarely used, however.

Instruments.—The instruments required for operating are a sharp scalpel or bistoury; two hooks, either blunt or sharp-pointed, for separating the edges of the wound; a sharp hook for fixing the trachea; a grooved director; and two pairs of ordinary thumb forceps. In addition to these, it is well to have within reach a number of artery clamps, an aneurism needle, curved and straight blunt-pointed scissors, silk and catgut ligatures of assorted sizes, and curved and straight needles.

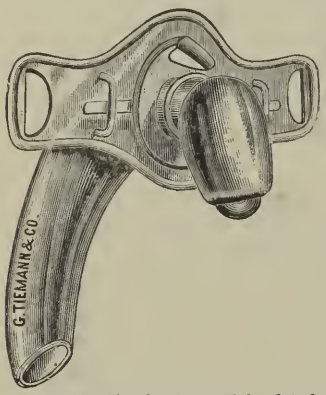

Fig. 179.—Tracheotomy Tube fitted with Luer's Valve.

Indications.—Among the diseases which produce narrowing of the lumen of the larynx, thereby interfering with respiration, and which may demand the operation, are œdema of the larynx, acute submucous laryngitis, acute and chronic subglottic laryngitis, syphilitic and tuberculous laryngitis, neoplasms of the larynx, foreign bodies in the larynx, fracture of the larynx, double abductor paralysis, and spasm of the larynx in children and, in rare instances, in adult life. It also may be demanded to gain access to foreign bodies in the trachea or bronchial tubes, and as preliminary to laryngotomy, laryngectomy, and other operations upon the upper air tract.

It should be borne in mind that a long continuance of laryngeal stenosis is liable to develop a weakness of vasomotor control in the blood-vessels of the bronchial mucous membrane, and thereby entail a danger of the sudden supervention of pulmonary œdema. On this account, as well as others, the greatest safety to the patient is secured by an early resort to the insertion of a tracheal canula. Moreover, the operation in itself is not one which is attended with any very grave dangers to life, and does not usually seriously complicate the disease for the relief of which it is performed.

The Use of Anæsthetics.—The trachea is frequently opened without anæsthesia when the symptoms are of such an urgent character as to demand immediate relief. If such urgency does not exist, however, there can be no question as to the propriety of securing that perfect relaxation and control of the patient, as well as the freedom from pain, which the anæsthetic affords.

Ether is exceedingly irritating to the mucous membrane of the air tract; it is liable to produce nausea and vomiting; it requires usually from ten to twenty minutes to secure perfect relaxation; the stage of excitement is frequently prolonged; and, moreover, in most cases it produces that troublesome churning movement of the larynx which proves a serious obstacle to the operator. The only argument in favor of this agent is its safety.

Chloroform, on the other hand, is unirritating to the air tract; it excites no movements in the larynx; it is rapid in its action; and it produces complete anæsthesia usually in from three to six minutes. Clinical experience teaches us that the danger attending its use, although not entirely absent, is very much less in child life than with adults. Unless, therefore, some special contraindication is present in the form of cardiac or other general disease, this agent should be given the preference in opening the trachea in children. In my own experience this has been the only anæsthetic used, and I have in no single instance seen any unfavorable symptoms develop from its administration.

The hypodermatic injection of twenty minims of a four-per-cent solution of cocaine into the integument immediately over the site of the cutaneous incision will produce sufficient anæsthesia to enable the surgeon to insert a tracheal tube with comparatively little pain, with the exception possibly of the last incision through the mucous membrane of the trachea. Injected in this way, the anæsthesia is maintained for from ten to twelve minutes, which ordinarily is an abundant time for completing the operation. This method, therefore, would seem to be an admirable resource when tracheotomy is demanded in adult life. It is a wise precaution to have chloroform or ether provided for use, in case of unexpected complications setting in which would demand either extension or prolongation of operative measures.

As regards the mixture of one part alcohol, two parts chloroform, and three parts ether, I have had but limited experience, but am disposed to regard it as quite as irritating to the mucous membranes of the air tract as pure ether. Another method is to administer chloroform until relaxation is secured, and subsequently to use ether. Chloroform anæsthesia does not prevent the unpleasant effects of ether; hence I do not think this method is to be commended in tracheotomy.

Regional Anatomy of the Parts.—Immediately beneath the integument covering the larynx and trachea anteriorly we come upon the superficial fascia, in which course from above downward the two anterior jugular veins, between the median line and the anterior border of the sterno-mastoid muscles, lying on either side of the

former about two-fifths of an inch distant from it. Just above the sternum they communicate by a transverse trunk. They vary in size in different subjects, and one is occasionally wanting. Their division may give rise to troublesome hemorrhage. Immediately beneath the superficial fascia we come upon the sterno-hyoid muscles above and the sterno-thyroid muscles below, the former being in apposition over the thyroid cartilage and first and second rings of the trachea, namely, above the thyroid isthmus, while below this point the sterno-thyroid muscles are in apposition. Separating these, we come down upon the deep cervical fascia, a dense membrane which is attached to the hyoid bone above and, passing downward over the thyroid cartilage, the crico-thyroid membrane, the cricoid cartilage, and the upper rings of the trachea, arrives at the upper border of the isthmus of the thyroid gland, where it divides into two layers, one passing in front and the other behind the isthmus, to reunite on its lower border. The thyroid isthmus is usually described as lying upon the second and third rings of the trachea, although, according to Koenig, in most instances in young children it extends as high as the lower border of the cricoid cartilage. Hueter, describing this portion of the deep fascia which invests the thyroid isthmus, designates it as the "laryngo-thyroid fascia," describing it as binding the isthmus to the lower part of the larynx and upon the trachea. Boese, however, has demonstrated that the fascia does not bind the isthmus directly upon the trachea, but rather holds it suspended over it, for if a transverse incision is made through the fascia above the point where it divides for inclosing the isthmus, the latter body can easily be lifted off the trachea. The practical point thus made by Boese is that, in the performance of tracheotomy above the isthmus, the tracheal rings in this way can easily be reached for incision and the insertion of a tube, without wounding the isthmus. A long, slender prolongation of the thyroid gland, called the pyramid, occasionally rises from the upper border of the left side of the isthmus, and may ascend along the side of the trachea as far as the hyoid bone. In rare instances this pyramid arises from the central portion of the isthmus, and is found in

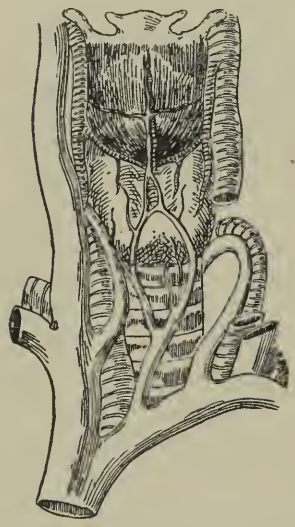

FIG. 180.—Diagram showing the Relations between the Larynx and Trachea and the Great Vessels of the Neck.

the median line. If found, this can easily be pushed to one side. Our main interest with the thyroid body lies in the fact that if it is wounded exceedingly troublesome hemorrhage may ensue. The veins which are found in the deep fascia are the superior and inferior thyroid veins. Above the isthmus these are small, somewhat unimportant, and lie so far to one side of the median line that they in no way are liable to complicate an operation. Below the isthmus and immediately over the trachea, we find a somewhat close network of veins, which carry the blood from the two lobes of the thyroid gland downward to empty into the innominate vein. This is called the intra-thyroid plexus. This plexus varies greatly in size, but should always be searched for in performing low tracheotomy, and, when found, the veins clamped and ligated before incision; otherwise, dividing them may give rise to exceedingly troublesome hemorrhage.

The only normal artery which is of importance in any of the forms of tracheotomy is the crico-thyroid, which crosses the crico-thyroid membrane. This is liable to be cut when the incisions are carried in this neighborhood. If it is borne in mind that this artery hugs somewhat closely the lower border of the thyroid cartilage, it can easily be avoided in making the incision.

Arterial Anomalies.—In a few cases, a small artery, designated by Neubauer as the *arteria thyroidea ima*, runs from the arch of the aorta along the front of the trachea to the lower border of the thyroid. The possibility of its existence should be borne in mind in connection with low tracheotomy.

The innominate artery, which normally crosses the trachea at about the level of the sternal notch, occasionally reaches so far into the cervical region as to become involved in the danger of wounding in low tracheotomy. According to Burns, it may reach as high as the lower border of the thyroid gland. Five cases have been reported by Burns in which both external carotids arose from the innominate artery. Thus, the left carotid necessarily crossed in front of the trachea.

Selection of the Operation.—In selecting the point of incision for the insertion of the tube, certain considerations are always to be borne in mind which weigh for and against each location in any given case. There are four operations which we group under the general designation of tracheotomy; these are: crico-thyroid laryngotomy, which consists in the insertion of a tube through the crico-thyroid membrane; laryngo-tracheotomy, in which the incision is made through the cricoid ring and the first ring of the trachea; supra-thyroid tracheotomy, in which the incision is made through two or

more tracheal rings above the isthmus of the thyroid gland; and infra-thyroid tracheotomy, in which the incision is made into the trachea below the thyroid isthmus. In addition to these, the incision may be made directly through the isthmus, either from necessity or, perhaps, accident, constituting what is designated as median tracheotomy. The insertion of the tube through the crico-thyroid membrane is rarely resorted to. The only consideration which weighs in its favor is the fact that cartilaginous incisions are thus avoided. Furthermore, in this operation there is a certain danger of wounding the crico-thyroid artery.

Laryngo-tracheotomy is perhaps the operation most frequently performed, for the reason that the cricoid cartilage lies almost immediately beneath the skin, and the procedure is thus much simplified. The objection to this operation is that this cartilage may be ossified; the pressure of the tube may result in cartilaginous necrosis; and, furthermore, it is to be borne in mind, if the operation is done for the relief of a diseased condition of the larynx, that the tube projects into the lower portion of this cavity, and hence its presence may aggravate the morbid process. Moreover, the insertion of the canula at this point, encroaching so closely upon the vocal cords, may give rise to subsequent vocal impairment.

In general, it is safe to state that those forms of tracheotomy which involve incisions through the laryngeal tissues have little to commend them, possess practically no advantages over a supra-thyroid tracheotomy, and in most instances are objectionable. If, however, the thyroid isthmus be found high up on the trachea, and not easily separated and depressed, incision through the cricoid ring is not only fully warranted, but may become necessary.

The supra-thyroid operation is the one to be performed probably in the large majority of instances, on account of the facility with which it is done, the trachea at this point not being very deeply embedded beneath the integument, and because it affords us a point for incision sufficiently remote from the diseased condition which demands it to fulfil all indications.

Infra-thyroid tracheotomy is the most difficult of all the operations, from the fact that the trachea at this point is more deeply embedded in the areolar tissue of the neck, especially in young children. Theoretically, this is the operation which should be performed in most cases. The surgeon, however, will select the higher operation in many cases, simply as avoiding the difficulties which are liable to be met with in the lower incision. If, however, the operation is done for diphtheria, it is a matter of special importance that the tube should be inserted as far away from the pseudo-membranous exuda-

tion as possible. This consideration should also operate in cases of malignant disease of the larynx.

When the wearing of the canula is liable to become a permanent necessity, as in cases of paralysis, tumors, tertiary syphilis, or other grave and incurable laryngeal affections, it is probably the wiser course to insert the tube below the isthmus, as in this position it involves less irritation and discomfort to the patient than if inserted higher up. In bronchocele, of course, the tracheal incision should be as low down as feasible.

Median tracheotomy is never indicated, and is only done as a matter of necessity, as, for instance, when the isthmus is high up and the lower tracheal incision is contraindicated from the presence of the arteria thyroidea ima, a high innominate artery, an anomalous course of the left carotid, or some other cause.

It is scarcely necessary to add in this connection that when the symptoms are urgent, and immediate suffocation seems threatened, the surgeon will select that operation which is performed with the greatest promptness and facility. Anatomical regions are recognized only when the operation is done with deliberation and by slow dissection. In an urgent case, therefore, these are necessarily ignored, and if the thyroid body is wounded it can scarcely be a matter for criticism.

The Operation.—The patient should be placed on a long, narrow table, so situated as to afford the operator abundant light. The shoulders should be elevated and the head thrown back, in order to render the integument tense and to bring into prominence the larynx and trachea, as far as possible. For this purpose, a hard pillow, or better still, perhaps, a rolling-pin around which several thicknesses of a towel have been wrapped, should be used. Two or three assistants should be present, or, better still, four—one to administer the anæsthetic, one to sponge, one to manage the instruments, and a fourth to directly assist the operator; for, although in many cases this operation is undoubtedly an exceedingly simple one, dangers and difficulties may arise at any moment which will demand quickness of decision and promptness of action, and these requirements will be better met when abundance of assistance is at hand.

Before beginning the operation, the neck should be washed first with soap and water, and subsequently bathed in a corrosive-sublimate solution, one part in two thousand. The instruments should be thoroughly disinfected by boiling, and placed ready for use in a tray containing a two-per-cent. solution of carbolic acid.

The technique in these different operations is much the same in

its successive steps, and we therefore describe the lower operation first, as involving the greater detail.

Infra-Thyroid Tracheotomy.—The cervical integument being placed upon the stretch, the general regional anatomy is mapped out by ascertaining the position of the thyroid notch and the crico-thyroid space, the latter being usually felt as a depression below the thyroid cartilage. If the subcutaneous areolar tissue is scanty, each individual ring of the trachea also may be located by the touch. The cutaneous incision (see Fig. 181) is made with the scalpel, extending in

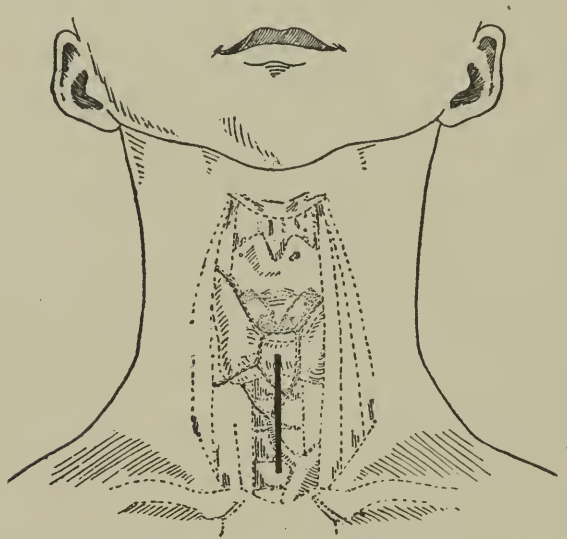

FIG. 181.—Diagram showing the Line of Cutaneous Incision in Infra-Thyroid Tracheotomy, and the Relation of the Underlying Structures.

the median line from the lower border of the cricoid cartilage downward toward the sternum for from an inch and a half to two inches or longer, according to the age of the patient and the apparent thickness of the areolar tissue. There is no objection to a free incision through the skin, as the facility of the operation is aided by obtaining abundant room for manipulation.

After the integument has been cut, the subsequent steps of the operation should be done by somewhat careful dissecting, and with but limited use of the knife. The integument, together with the superficial fascia which has been cut through with the skin, is now separated by the handle of the scalpel, and the sterno-thyroid muscles brought into view, after pushing aside such areolar tissue as may present in the wound. The muscles are now separated by the handle of the scalpel, and held apart by retractors in the hands of an assist-

ant. This brings into view the deep fascia which covers the trachea below and separates into two layers above, one passing in front and one behind the thyroid isthmus. This latter body is now recognized through the thin anterior layer of the fascia as a pinkish-red mass, lying upon the second and third rings of the trachea. The deep fascia should now be seized, opposite the lower border of the thyroid isthmus, with the mouse-toothed forceps, lifted up, and nicked with a knife or pair of scissors. A grooved director should then be passed beneath it, from above downward, and, the fascia being raised, any blood-vessels that it may contain are thus brought into view and ligated or clamped, as may seem preferable. The fascia being incised upon the director and drawn apart by the retractors, we come down now upon the trachea, covered with a certain amount of loose cellular tissue through which course the veins which compose the thyroid plexus.

The wound should now be explored by the index finger, and the trachea and tissues immediately about it palpated to detect the possible existence of any pulsating vessels. The cellular tissue covering the trachea with its veins is now pushed aside with the index finger, or better still, perhaps, with the handle of the scalpel, and the trachea brought into view. This is now seized by a sharp hook, lifted from its bed, and brought under closer inspection, when, if its anterior surface is found free from blood-vessels, an incision is made, by means of the sharp-pointed bistoury, sufficiently long to admit of the insertion of the tube (see colored plate).

The edges of the tracheal wound should now be held apart by means of the dilators, and the patient be allowed to cough, to expel such blood as may have made its way into the air tract.

Occasionally, when the trachea is first opened and held open in such a way as to enable the patient to respire fully, a single deep inspiration is taken, after which breathing seems to cease for a time. This is not an unusual occurrence, but to an inexperienced operator might excite serious apprehension.

The tube is now inserted and secured *in situ* by means of the tapes about the neck, when the wound is closed and the integument brought together by proper sutures.

The use of tracheal dilators or a pilot trocar to facilitate the insertion of the tube, I do not think necessary. Some surgeons advise that two silk threads be passed through the trachea, one on either side of the median line, and that subsequently the incisions be made between them; in this way the edges of the wound can be drawn apart for the insertion of the tube; and, moreover, it is claimed that the mucous membrane, being enclosed in the loop, is less apt to be

pouched in the primary tracheal incision. This latter accident is one that can easily happen, but when it occurs it should be recognized and promptly corrected by a subsequent incision, either with the sharp-pointed bistoury or curved scissors.

Accidents and difficulties such as this, which arise during the performance of this operation, are in many instances, I think, in no small degree the result of imperfect illumination. The light from an adjacent window may be so concentrated by a concave reflecting head-mirror as to illuminate thoroughly the parts, and thus enable the operator to recognize anatomical relations.

A number of writers have advocated in certain cases the propriety of dispensing with the tube after the operation. The procedure consists in inserting either silk or wire sutures into the edges of the incision, and maintaining traction by uniting the threads at the back of the neck. Wyeth, in a case of foreign body in the bronchus, successfully sutured the tracheal rings to the integument. The main advantage in dispensing with the tube is that, in case of a foreign body in the air tract, it is more easily expelled when dislodged, and in cases of fibrinous exudation, also, the membrane, when detached, is voided with greater facility. As securing the same object, Braatz has devised an instrument which he calls a tracheal speculum; this is practically an automatic retractor, whose action does not differ notably from the tracheal retractor of Minor, shown in Fig. 158.

There can be no question of the propriety of temporary resorts of this kind. In ordinary cases, however, I think the surgeon will feel a greater sense of security, after a successful tracheotomy, when a suitable canula is properly inserted and firmly secured *in situ* than when impromptu dilators are used or sutures are inserted, which must necessarily require careful and constant watching. We do not usually consider the maintenance of the tube in position as a matter of any great difficulty, and yet when tracheotomy is done on a young child, the displacement of the tube is an accident the possibility of which should always be borne in mind. When this occurs, the reinsertion of the canula may be attended with no little difficulty, and in many instances will necessitate the complete reopening of the wound. As avoiding this danger and as a precautionary measure, I think it well in all cases during the performance of the operation to insert a silk thread or, better still, a silver wire into the trachea on either side of the incision. A loop is then formed, which is carried out upon the neck and allowed to remain. If in such a case dyspnœic symptoms supervene, and in the investigation of them it seems wise to remove the tube, this can be done with perfect safety, and the patency of the trachea maintained by traction of the sutures. Further-

more, this very markedly facilitates the reintroduction of the canula. In this manner, the removal of the tube can safely be trusted to an attendant. An additional advantage lies in the fact that, if false membrane in the trachea becomes detached or invaginated, thus producing dyspnœa, the prompt removal of the tube will usually facilitate its expulsion.

Supra-Thyroid Tracheotomy.—In this operation the cutaneous incision (see Fig. 182) commences in the median line opposite the middle of the thyroid cartilage and extends downward from two to three inches, as may seem necessary. On cutting through the superficial

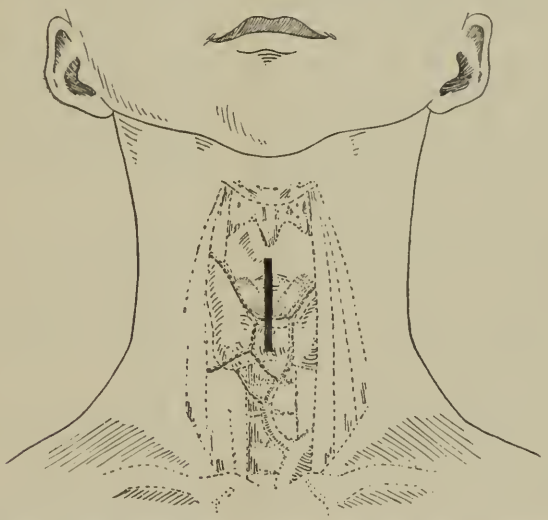

FIG. 182.—Diagram showing the Cutaneous Incision for Opening the Air Passages above the Thyroid Isthmus, and the Relation of the Underlying Structures.

fascia the sterno-hyoid muscles are met with and separated by means of retractors in the hands of an assistant. This brings into view the deep fascia, with the thyroid isthmus showing through it in the lower portion of the wound. The parts are now thoroughly cleared, by the use of the scalpel handle, of such areolar tissue as may be found, when an inspection of the wound will enable the operator to determine the relation of the isthmus to the tracheal rings. If sufficient room is found for the insertion of the tube, the deep fascia is incised longitudinally in the median line and retracted, whereupon the trachea is reached. If, however, the thyroid isthmus lies high up, it will be necessary to make a transverse incision through the deep fascia, over the cricoid cartilage, above the isthmus, and of sufficient length to admit the handle of the scalpel. This is then inserted from above

and passed down between the thyroid isthmus and the trachea, and the former lifted and pressed downward in such a way as to expose the first two or three tracheal rings. The space thus gained is secured by means of a retractor, after which the trachea is seized with a tenaculum and the first two or three rings incised. The subsequent steps differ in no essential degree from those already described in the performance of the lower operation.

Laryngo-Tracheotomy.—This operation differs from the one last described only in the fact that the incision is carried upward through the cricoid ring and into the crico-thyroid membrane. The serious objection to it lies in the fact that it involves a comparatively extensive cartilaginous section, and may result in necrosis of the cricoid from the pressure of the tube. Moreover, it encroaches upon the larynx. It is very rarely performed, and its main justification is in a case of abnormally high position of the thyroid isthmus, which does not admit of a lower incision. It is very rare, however, that this body cannot be sufficiently depressed to permit incision through the upper rings of the trachea.

Crico-thyroid Laryngotomy.—In this operation the incision into the air passages is confined to the crico-thyroid membrane. It is an exceedingly simple operation, may be rapidly performed, and is practically unattended by hemorrhage. Hence, it is especially valuable when the urgency of the case is very great.

It can be resorted to only temporarily, however, because the tissues of the larynx are far more sensitive than those of the trachea, and a tube in this position is not easily tolerated, and may not only excite inflammatory reaction but interfere with local function. Moreover, this space will admit of only a comparatively small tube. In performing the operation, an incision is made in the median line, extending from the thyroid notch downward from an inch to an inch and a half. This is carried well through the integument, which being drawn aside, the thyroid and cricoid cartilages are exposed. Such areolar tissue and superficial veins as are found are pushed aside by the handle of the scalpel, and the crico-thyroid membrane brought into view. This is punctured vertically, and subsequently a transverse incision is made through the whole extent. The crico-thyroid artery, running closely upon the lower border of the thyroid cartilage, is easily avoided, with a knowledge of its position. The possibility of the extension of the thyroid isthmus to this region is always to be borne in mind.

Median Tracheotomy.—If it becomes necessary from any cause to insert a tube into that portion of the trachea which is covered by the thyroid isthmus, it seems scarcely necessary to say that our first

efforts should be either to depress or to raise this body in such a manner as to give sufficient access to the tracheal rings for incision. Failing this course, two ligatures should be passed beneath the isthmus, one on either side, and the part ligated in such a manner as to permit of its being divided in the median line, after which the remaining steps of the operation can be easily concluded in the manner already described.

Rapid Tracheotomy.—The operations above described involve carefulness of detail and recognition of anatomical relations. It may be necessary occasionally, either on account of the urgency of the case or the necessity of doing the operation without sufficient light to enable the operator to recognize the anatomical relations, to perform what is called a rapid tracheotomy.

The larynx and trachea are firmly grasped between the thumb and first two fingers of the left hand in such a way as to draw them forward from the spinal column, while at the same time the skin is rendered somewhat tense and immovable over the parts. A bistoury is then plunged directly through the crico-thyroid membrane, and then by a sawing movement the cricoid cartilage and the upper rings of the trachea are cut through from within outward. In withdrawing the knife, the cutaneous incision is extended down somewhat farther. The tube is then immediately inserted. Durham seizes the larynx in the same manner, pulls it forward, and cuts from without inward, making his incisions rapidly until the tracheal cartilages are reached, when he either opens the windpipe in the same way or seizes it with a tenaculum and opens it more deliberately. While these operations may be rendered necessary in certain cases, they certainly cannot be commended as surgical procedures.

After-Treatment.—When a canula is inserted into the trachea, the important functions of the nasal chambers with reference to respiration are practically abolished, and hence the after-treatment in any case of tracheotomy consists in such measures as will, as far as possible, supply the deficiency in warmth and moisture which the operation has entailed, and absence of extraneous matters in the inspired air.

In an acute case, and in all cases for a certain period after the tube has been inserted, the room should be kept at a temperature of fully 75° F.; it should be fully surcharged with moisture; and in addition to this the tube should be covered with a number of layers of thin gauze, which should serve to filter the inspired current of air, without in any degree hampering the free entrance of air to the lungs. In addition to this, the gauze should frequently be moistened, in order that the inspired air may as far as possible be thoroughly saturated

When a tube is inserted for a chronic laryngeal stenosis, with the prospect of its being either a prolonged or permanent necessity, the precautions above detailed should for the while be borne in mind, and to a certain extent carried out. Even in such a case as this, however, nature seems to adapt itself in a remarkable way to new situations, and certainly, in my own experience of such cases, the canula seems to be worn with a certain degree of immunity to the mucous membrane of the air tract, the only precaution that is necessary being that the mouth of the tube should be covered with a few thin folds of gauze or silk, to prevent the entrance of insects or floating impurities in the atmosphere.

Removal of the Tube.—There are certain accidents which may result from the wearing of a tube which interfere with its withdrawal, even after the disease for which the trachea has been opened has subsided. A number of cases have been observed in which granulations sprung up about the wound to such an extent as to cause notable stenosis. This, of course, only occurs after the tube has been worn for a considerable period. After the passage of air through the larynx has been abolished for a considerable period, its sudden restoration by the removal of the tube and the closing of the tracheal wound may excite a glottic spasm. Another accident, though rare, is bilateral paralysis of the abductors. How this should occur it is difficult to understand. It might possibly result from the insertion of a tube through the cricoid cartilage, or from local changes the result of the presence of a canula. If the respiratory movements of the glottis were abolished by opening the trachea, the abductor muscles might undergo degeneration from lack of use. In withdrawing the tube, the larynx should be thoroughly examined by means of the laryngoscope and its patency observed, as well as the laryngeal movements, and especially should granulations be sought for. Of course, before removing the canula, the patency of the air tract should always be tested, by simply closing the mouth of the tube, as in most instances there is abundant breathing-space around its periphery, even when a fenestrated canula has not been used. In no case should the tube be retained longer than is absolutely necessary, since the longer the tube is *in situ* the greater the danger of granulations forming. When they occur, they should be destroyed by efficient cauterization or, if necessary, by the use of the curette. These granulations, of course, are subglottic, and the manipulation necessary for their destruction is made through the tracheal opening. Occasionally it may become necessary to reopen the original wound, to obtain free access to the trachea for their complete ablation.

CHAPTER XCVIII.

EXTIRPATION OF THE LARYNX.

[*See colored plate*].

Probably no operation in our day illustrates more strikingly the daring and skill of modern surgery than the successful extirpation of the larynx in the human subject. To Czerny is due the credit of demonstrating the feasibility of this procedure in the human subject, as the result of a successful series of experiments on dogs. Accepting Czerny's conclusions, Billroth performed the operation with such a degree of success that laryngectomy was immediately placed among the recognized and justifiable surgical procedures in cases of malignant disease of the larynx.

Indications for the Operation.—In addition to carcinoma and sarcoma, the larynx has been extirpated for syphilitic cicatrices, papilloma, lupus, and perichondritis. When we consider that in itself the operation involves not only immediate and grave dangers to life from shock and hemorrhage, and also that it may be followed by serious complications, such as pneumonia, pleurisy, and septicæmia, the propriety of subjecting a patient to these dangers becomes a serious question, unless life be threatened by the gravity of the laryngeal disease. Moreover, a prudent surgeon would scarcely assume the responsibility of operating in malignant disease of the larynx unless the morbid process was still largely confined to the laryngeal cavity.

Restricting, then, the indications for laryngectomy to malignant disease of the larynx, it seems scarcely necessary to add that an early resort to surgical interference, when the diagnosis is thoroughly established, offers the best hope for the relief of the patient.

The Operation.—When a tracheal canula has not already been inserted, many operators advise that a preliminary tracheotomy be done from one to two weeks before the more radical operation is attempted. This would be a wise procedure when the vital powers of the patient are depressed by the deficient oxygenation which a long-continued laryngeal stenosis might entail. If, however, this special indication does not exist, I see no objection to inserting the tracheal

tube at the same time the laryngectomy is performed. A number of operations have been done without the insertion of any tracheal tube, a properly fitting tube being at hand for insertion into the proximal end of the trachea as soon as this is divided in the operation. The advantage of this latter procedure lies in the fact that the air passages are not opened until the trachea is cut through. In this way one of the greatest difficulties in the performance of the operation is avoided, namely, the flow of blood into the trachea, which might give rise to serious dangers and complications. In order to avoid this flow of blood into the trachea during the operation, a number of specially devised instruments have been constructed. In Fig. 183 is shown Trendelenburg's apparatus, which consists of an ordinary

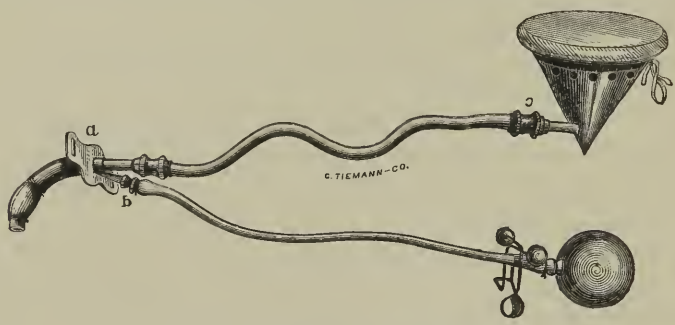

FIG. 183.—Trendelenburg's Apparatus.

tracheal canula fitted for about a half an inch of its distal extremity with a rubber sheath. The small canula, to which a rubber pipe and bulb is attached, is so arranged that air can be forced between the tube and the rubber sheath in such a way as to inflate the rubber, thus filling up the space between the tube and the inner wall of the trachea and preventing the passage of blood into the parts below. An inhaling apparatus is also connected by a rubber tube with the upper extremity of the tracheal canula, thus facilitating the administration of the anæsthetic at a distance from the operator. I have used this apparatus in a number of instances, but never with satisfacton, the distention of the sheath seeming to arrest respiration. Whether this is the result of reflex action from pressure on the tracheal membrane, or from the rubber sheath extending over and blocking up the distal end of the tube, I am in doubt. A more efficient and less objectionable device is that of Gerster, seen in Fig. 184, which consists of a number of delicate steel springs placed longitudinally around the lower end of the tracheal canula and covered by a rubber sheath. By turning a thumbscrew attached to the upper extremity of the neck-plate, these springs are made to bulge outward

in such a manner as to completely fill the intervening space between the canula and the tracheal wall. It is provided with an inhaling apparatus similar to that of the Trendelenburg device for administering an anæsthetic. Michael accomplishes the same result by firmly attaching a properly fashioned piece of compressed sponge to the lower end of the canula, and covering it with gold-beaters' skin, attached below but not above. After insertion, the moistening of the sponge causes sufficient swelling to tampon the trachea. Hahn, on the other hand, simply invests the tracheal end of the tube with a layer of compressed sponge which has been impregnated with a saturated solution of iodoform and ether, omitting any external covering.

If the trachea is cut through at the earlier part of the operation, as before suggested, the lower segment is pulled forward and a tube

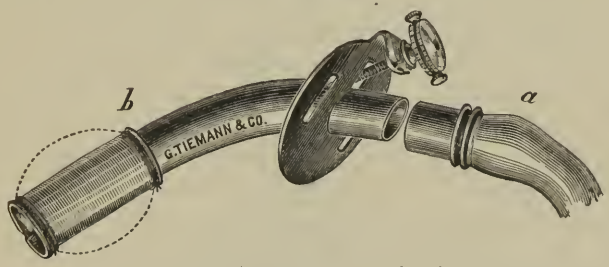

FIG. 184.—Gerster's Tampon Canula.

inserted, and hence these devices are unnecessary. If, on the other hand, the first dissections are made about the upper portion of the larynx, blood necessarily will enter the air tract, and hence some form of tampon canula will be rendered absolutely essential. In such cases preference, I think, should be given either to Gerster's device or to that suggested by Michael.

The details of the operation are as follows: A longitudinal incision is made through the integument in the median line, extending from the hyoid bone to the third or fourth ring of the trachea. If high tracheotomy has previously been done, the incision will necessarily be extended into the original wound. If low tracheotomy has been done, it will be better that an interval of normal integument should be, temporarily at least, allowed to intervene. In order to obtain wider access to the region for later manipulation, an additional incision may be made transversely along the line of the hyoid bone, at the upper end of the longitudinal incision (see Fig. 185). The soft tissues covering the thyroid cartilages are now pushed aside by means of the handle of the scalpel, and the whole cartilaginous framework of the larynx gradually uncovered by this means and by dissec-

tion. The first artery encountered is the crico-thyroid, which should be ligated. If the morbid process in the larynx is still intrinsic and does not involve the external tissues, perhaps the best method to follow now is to incise the perichondrium from the supra-thyroid notch downward in the median line and separate it from the cartilage, first on one side and then on the other. With the removal of the perichondrium, the overlying muscles are detached *en masse*. This separation can be done with the ordinary elevator, or perhaps with the handle of the scalpel. This perichondrial separation is carried

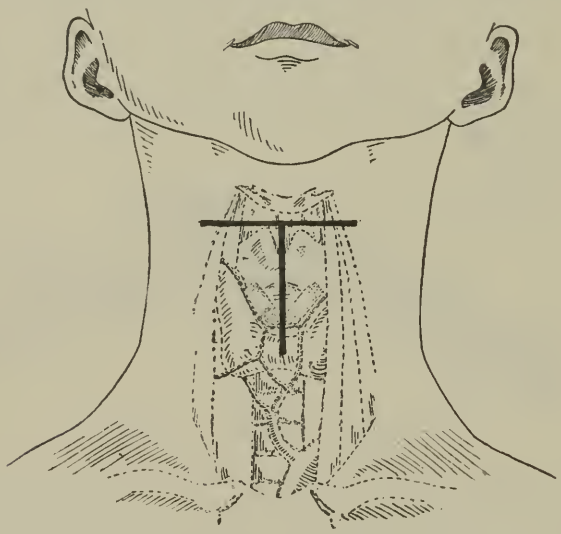

FIG. 185.—Line of Cutaneous Incision for Excision and Resection of the Larynx, with the Relative Position of the Deeper Structures.

backward to the posterior border of each thyroid ala, and the same process repeated on the cricoid ring. After this has been done, the transverse incision is deepened, and the thyro-hyoid membrane exposed and incised along the upper border of the thyroid cartilage. The superior laryngeal artery is cut by this incision, and will require ligation, or it may be sought for and a double ligature placed about it previous to division. The thyroid cartilage is then freed in such a manner that it can be pulled somewhat forward by means of a blunt hook, when by digital exploration the superior cornu is found, with the lateral thyro-hyoid ligament, which is cut through. The same process is now repeated on the opposite side.

The subsequent steps will depend on whether the epiglottis shall be removed or left *in situ*. The earlier operators endeavored to leave this organ, with the idea that its special function might be preserved.

Clinical experience has shown that even in cases in which the malignant process has not attacked this portion of the larynx, its function is practically abolished, for no artificial apparatus has yet been devised to which the epiglottis can adapt itself in preventing the entrance of food into the larynx. Practically it is a hindrance rather than a help in the subsequent management of the case. It will probably be better, therefore, in most instances, to remove it with the other portions of the larynx, without regard to the question whether it is involved in the diseased action or not. If it is left in position, the subsequent steps of the operation will consist in carrying the incision through the thyro-hyoid membrane directly across from one side to the other, following closely the upper border of the cartilages, thus cutting directly through the epiglottic petiolus. If the epiglottis is to be removed with the remaining portion of the larynx, the thyro-hyoid incision is carried higher up near the lower border of the hyoid bone, in order to avoid severing the epiglottic attachments. The larynx now is held in position only by its attachments to the yielding œsophagus, and hence is easily tilted forward to a considerable extent, when its posterior wall is brought into view with the œsophageal entrance. The larynx is now drawn forward by means of a volsellum, and its attachments severed posteriorly by careful dissection. The most serious accident that can occur at this stage of the manipulation lies in the danger of "buttonholing" the œsophagus. This is avoided by inserting the index finger or a sound into this passage, and conducting the subsequent dissections with this as a guide, taking care always that the edge of the knife shall incline forward and be made to follow closely the laryngeal cartilages. In this way the dissection is carried on from above downward, until the whole of the larynx is cleared from its posterior attachments down as far as the first ring of the trachea, or lower if necessary. During this dissection we encounter the middle laryngeal artery, which is to be treated in the same manner as the superior laryngeal. The point of tracheal section having been decided upon, the operation is completed by cutting through the trachea at such point, two sutures having previously been inserted into the trachea below the selected point of section, for the purpose of attachment to the integument. The destruction of the tracheal support in the removal of the larynx may give rise to one of the most serious complications which follow the operation, in that, on account of the removal of these attachments, the trachea has a tendency to sink into the thorax. This is avoided in the manner above stated, by suturing the lower fragment to the integument. An additional security can be afforded also in those cases in which a low tracheotomy has been done, by suturing the edges of the incision at

this point to the integument, although, if the canula has been *in situ* for some time, the cicatricial adhesions which have resulted from the wound will of course do away with any indications for suturing at this point.

In the above operation, as we have seen, the only notable arteries encountered are the superior and middle laryngeal arteries and the inferior laryngeal or crico-thyroid artery. In a case, therefore, of intrinsic cancer which has assumed large proportions the above operation is accomplished without the danger of troublesome hemorrhage. Laryngectomy is generally regarded as an exceedingly bloody operation. This applies to those cases in which the morbid process has assumed large proportions, and has resulted in an extensive distortion of the organ, as a result of which small arterial branches have acquired considerable size and are encountered in unexpected places. Undoubtedly the advantages are decidedly in favor of operating from above downward, for in this way the incision into the air tract is made the last step of the operation, thus very largely avoiding the danger of blood flowing into the trachea. Moreover, it would seem that the extent of the diseased process can be more easily estimated by commencing the operation above, and the extent of the operation decided upon with a greater degree of nicety, than when the manipulation is done in the reverse way.

The exigencies of the case or perhaps the choice of the surgeon may dictate the advisability of commencing the operation below. In this case the general steps are much the same as those already described, only the procedure is reversed. In this operation the preliminary tracheotomy may be dispensed with. The primary incision is made as before described. The trachea is then uncovered, drawn forward by a tenaculum and incised at the point of section, when, the lower fragment being drawn forward, a tube is inserted, and subsequently the upper fragment is lifted from its bed and the dissection carried on from below upward. In this manipulation the lower fragment is to be secured to the integument by means of sutures, as before, especial care being taken that the canula should be so inserted into the trachea, and so tightly tamponed, that no blood can pass into the air passages.

The operation, of course, will necessarily vary in different cases, according to the special conditions which present. The extent of diseased action cannot always be determined accurately before operation, and the surgeon will be compelled to vary both his primary incision and his subsequent dissections, according as the disease may be found to have extended into the pharynx, or perhaps to the base of the tongue above, or into the œsophagus below, or according as the

necessity presents for dissecting out diseased lymphatic glands, wherever found.

After-Treatment.—After the operation has been completed, and all hemorrhage or oozing has ceased, the wound should be thoroughly cleansed by a corrosive-sublimate solution of the strength of 1 to 5,000. The whole wound then is packed with iodoform gauze, a soft rubber catheter having previously been inserted into the œsophagus and the tracheal canula maintained in position. The looser folds of integument at the extremities of the original cutaneous incision may be drawn together by a few sutures. The main portion of the wound, however, should be left open and supported by temporary dressings. Food and drink for the first few days should be administered entirely through the œsophageal catheter, although at the end of the fourth day the patient should be encouraged to make the attempt to take some fluid through the natural passages. If low tracheotomy has been previously done, the tube should remain in position for three or four days after the operation, when it can be removed and the patient allowed to breathe through the upper opening of the trachea, if feasible, or possibly it may be necessary to insert a tube at this point, the local dressings being modified to admit of this. During the following fortnight the closest attention will be demanded to meet such conditions as may arise and to give such aid to the patient as may be possible, as he gradually adapts himself to the new conditions which the removal of such an important organ has entailed. The stomach tube is removed at the end of the fourth or fifth day, and as the patient acquires the ability to swallow naturally it may be left out permanently, although its frequent reintroduction may be necessary, either through the wound or through the mouth. The healing process goes on somewhat rapidly, and at the end of two or three weeks the parts will have assumed, under the process of cicatrization, somewhat of their ultimate contour, when an attempt may be made to supply an artificial apparatus to take the place of the organ which

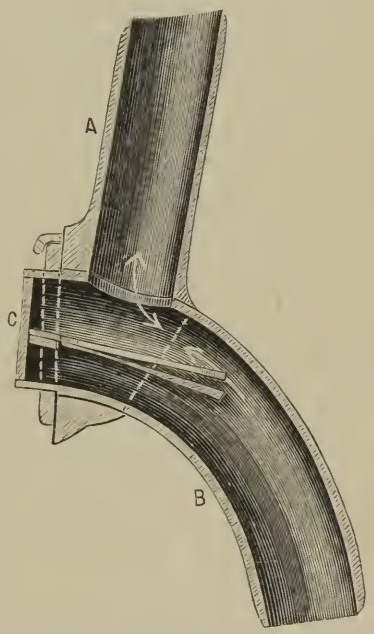

Fig. 186.—Gussenbauer's Artificial Vocal Apparatus.

has been removed. This of course should not be attempted too early, for the impact of the metallic instrument is liable to produce erosions and possibly serious hemorrhage.

The Artificial Larynx.—The efforts made to fit an artificial apparatus to supply the place of the organ which has been removed have not usually been attended with notable success, although in a number of instances the patient has been enabled to articulate clearly, and thus to carry on a conversation with considerable ease. In Fig. 186 is shown the apparatus devised by Gussenbauer. It consists practically of an ordinary tracheal canula, *B*, to which is fitted a second tube, *A*, extending upward and opening into the pharyngeal cavity. There is thus established a continuous channel, by means of which the respiratory current of air can be directed up to the oral cavity. By inserting the vibrating reed into the continuity of this channel, and closing the cervical aperture of the canula, this expiratory current is thrown into vibrations which are subsequently converted into articulate language by the lips, tongue, etc., as in the normal process. A serious difficulty which has been encountered in fitting these devices has been in preventing the oral and pharyngeal secretions, as well as food and drink, from making their entrance into the air passages from above. This is not successfully accomplished by the epiglottis, as a rule, when this organ has been left *in situ*. Gussenbauer fitted an artificial epiglottis to the upper end of the oral tube, in the form of an automatically closing hinged cap, which served a fairly successful purpose. A modification of Gussenbauer's instrument has been devised by Park.

CHAPTER XCIX.

RESECTION OF THE LARYNX.

[*See colored plate.*]

This term is generally used to designate the more or less complete removal of one lateral half of the larynx; although technically it may include any operation which involves removal of any portion of the laryngeal cartilages.

The indications for the operation are practically confined to instances of malignant disease which have not become generalized, and to cases of syphilitic stenosis. The amount of tissue to be removed, therefore, and the parts to be excised will necessarily vary to a certain extent in each individual case.

The Operation.—A longitudinal incision is made through the integument in the median line, extending from the hyoid bone to below the cricoid ring. The upper extremity of the incision is then extended horizontally on the side which it is desired to remove, as far as the greater cornu of the hyoid. The longitudinal incision is then carried well down upon the thyroid cartilage, when the lateral flap is dissected up, together with the perichondrium of the thyroid cartilage. The arteries encountered are the superior, middle, and inferior laryngeal or the crico-thyroid, and may need ligation. When the thyroid ala has been completely denuded of its perichondrium as far back as its posterior border, the cartilage should be cut through in the median line, as in thyrotomy, thus gaining free access to the laryngeal cavity. The edges of the wound should now be thoroughly retracted and the cavity of the larynx explored, the extent of the diseased process recognized, and the various landmarks established, to aid in the subsequent manipulation. These points having been determined, the attachment of the thyro-hyoid membrane along the upper border of the cartilage should be severed, when the ala is seized by a stout pair of forceps, drawn well forward, and its attachments posteriorly and inferiorly cut through, either by means of a bistoury or better still perhaps with the curved scissors. The wound should now be carefully dried, and an effort made to determine how much of the lining membrane of the larynx, or what diseased tissue,

has been extracted with the fragment already removed. Usually the incision will have extended through the ventricular band, and also anteriorly through the vocal cord. The orifice of the œsophagus should now be sought and a sound inserted, when the arytenoid cartilage can be seized and excised by means of the scissors. The further steps of the operation consist simply in searching for evidences of the morbid process, and the removal of such portions as excite suspicion of having been invaded.

As a rule, when a simple exsection rather than laryngectomy is indicated, the morbid process will not have invaded the epiglottis. If this organ is diseased, of course it can be completely excised or one-half of it removed by means of the scissors. If the cricoid cartilage is found invaded, its removal in a manner similar to that of the thyroid ala involves no special difficulties.

As regards the preliminary insertion of a tracheal canula, the same rule applies as in the case of complete extirpation of the larynx: there can be no question that the previous introduction of a tracheal tube greatly simplifies the operation.

After-Treatment.—After the operation is completed, the wound should be packed with iodoform gauze, and the flaps brought together and supported by loose adhesive strips. Deglutition is somewhat difficult and perhaps painful, but by no means impossible, after this operation; and although occasionally it may be necessary to make use of the stomach tube for the first twenty-four to forty-eight hours, the patient very soon is enabled to swallow fluids effectively and with no great discomfort. At the end of the second or third day an attempt should be made to close the external wound, although if there is much suppuration it may be wise to insert a small drainage tube in its lower portion. During the first few days the tampon canula is to be retained in position in order to prevent the entrance of the discharges into the air tract. As soon as feasible, the ordinary fenestrated canula should be tried and the attempt made to breathe through the natural passages.

The effect of removing half of the larynx is necessarily to destroy the voice, and yet, as the parts heal, the effort of nature to adapt herself to the new conditions is attended by no little success, in that not infrequently the tissues of the diseased side solidify to such an extent that the approximation of the healthy vocal cord to them forms a glottis capable of producing a fair degree of phonation.

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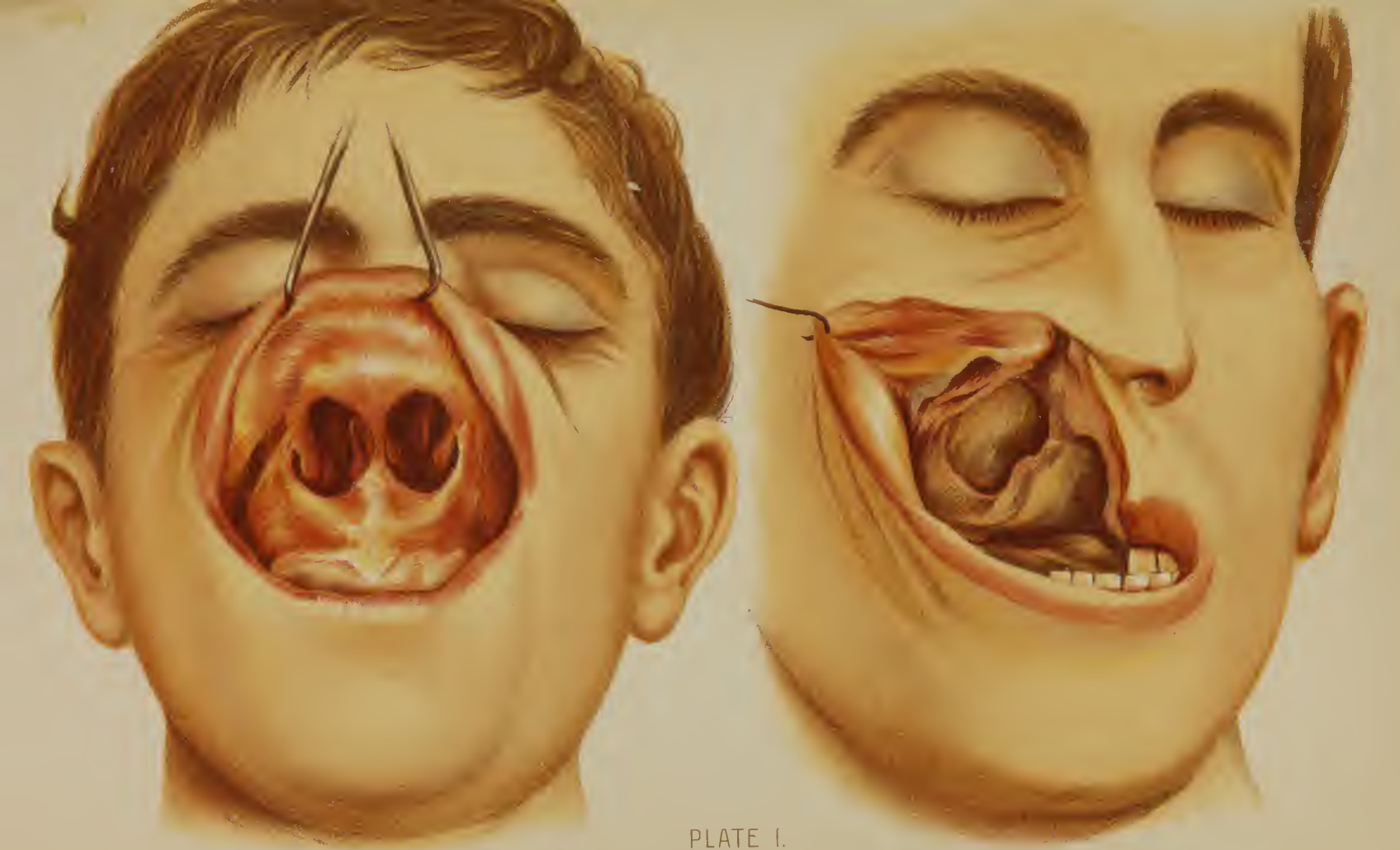


PLATE I.

FIG.I ROUGE'S OPERATION.

FIG II MAISONNEUVE'S OPERATION FOR THE PERMANENT RESECTION OF THE LOWER PORTION OF THE SUPERIOR MAXILLA.

PLATE II.

FIG I. OLLIER'S OPERATION FOR DEPRESSING THE EXTERNAL NOSE.

FIG II. CHEEVER'S OPERATION FOR THE TEMPORARY DEPRESSION OF BOTH SUPERIOR MAXILLAE.

PLATE III.

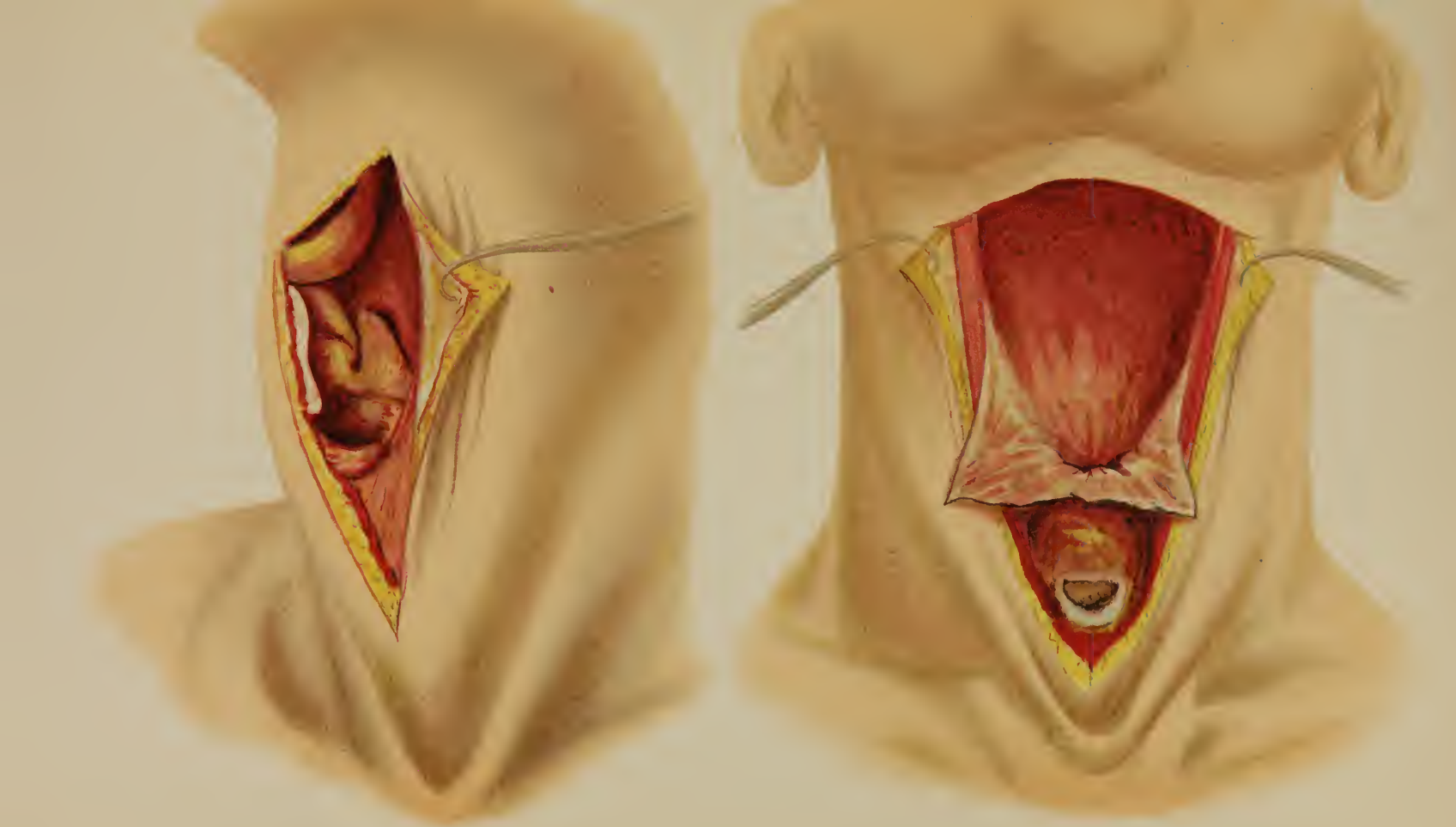
FIG. I LANGENBECKS OPERATION FOR THE TEMPORARY RESECTION OF THE NASAL BONE.

FIG. II PEAN'S OPERATION FOR THE PERMANENT RESECTION OF THE LOWER POSTERIOR PORTION OF THE SUPERIOR MAXILLA.

PLATE IV.

FIG. I. LANGENBECK'S OPERATION FOR THE TEMPORARY RESECTION OF THE UPPER PORTION OF THE SUPERIOR MAXILLA.

FIG. II BRUNS OPERATION FOR THE LATERAL OSTEO-PLASTIC RESECTION OF THE EXTERNAL NOSE.



UNILATERAL RESECTION OF THE LARYNX

EXTIRPATION OF THE LARYNX.

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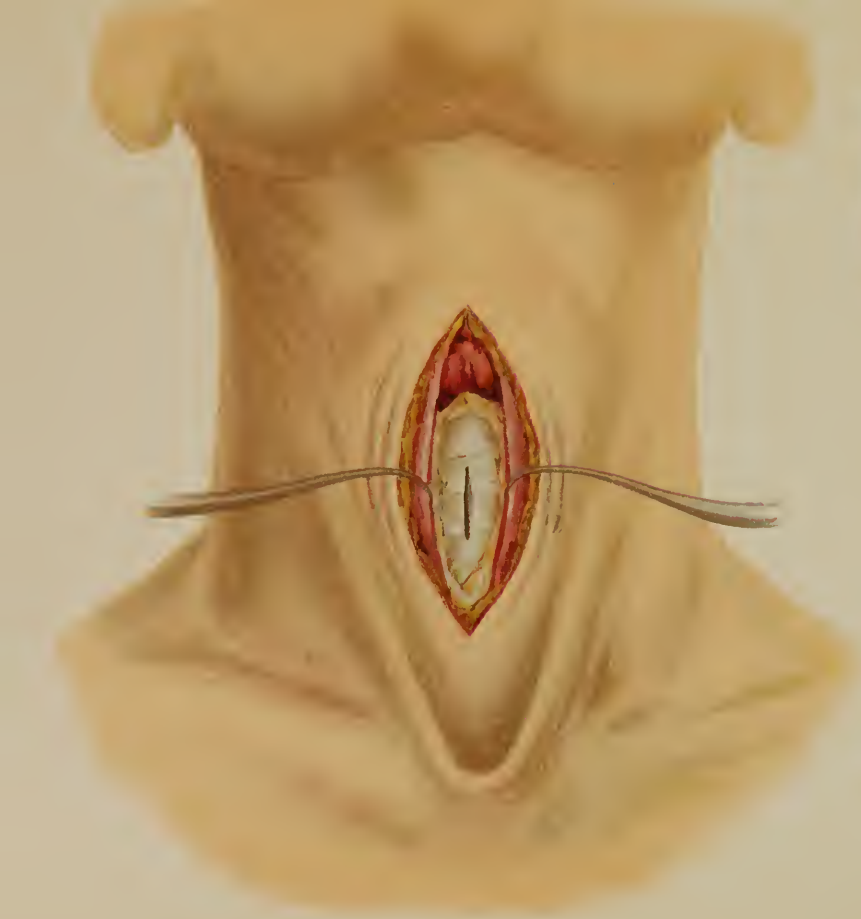

LOW TRACHEOTOMY

THYROTOMY.

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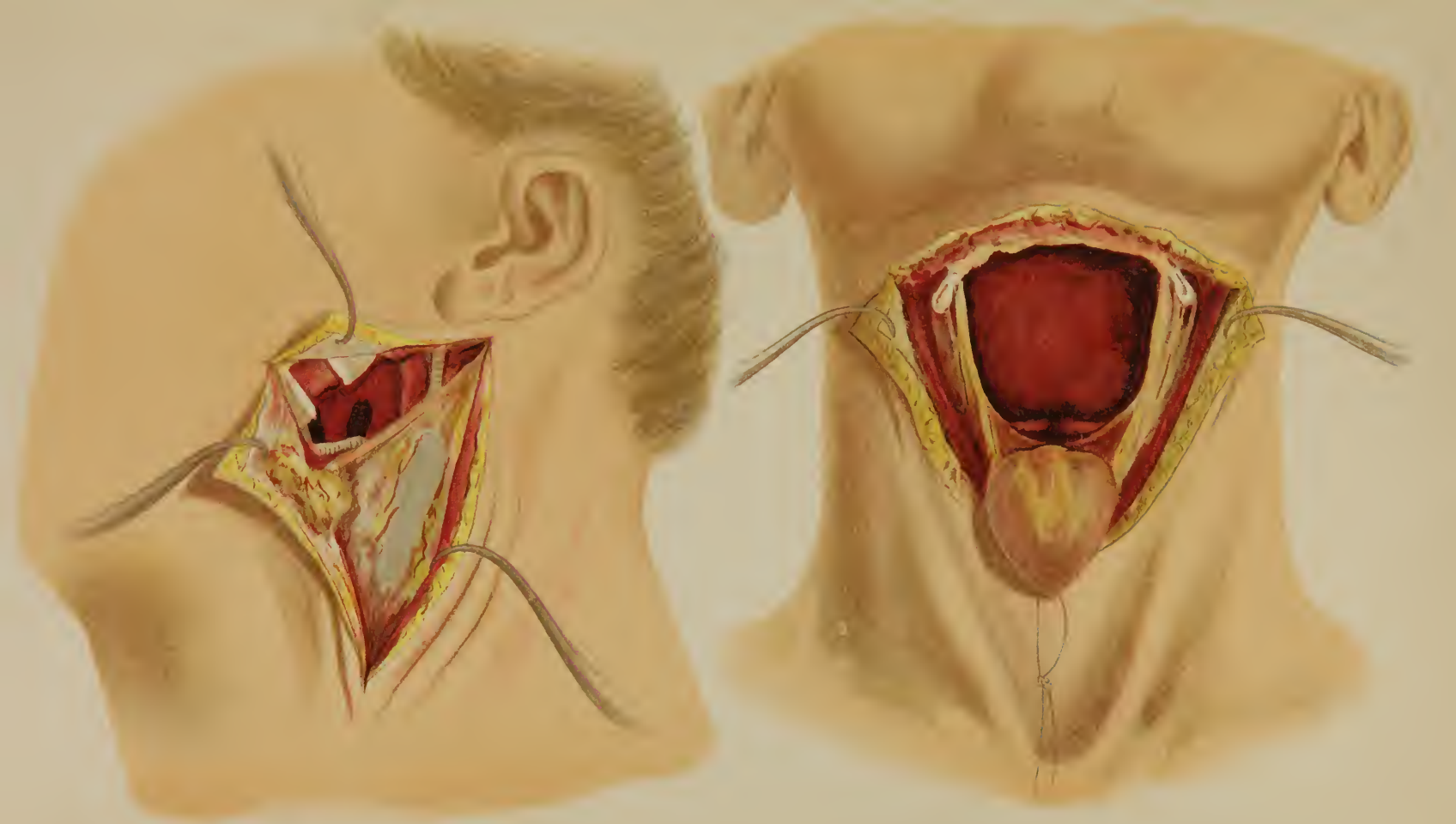

LATERAL PHARYNGOTOMY.

SUB-HYOID PHARYNGOTOMY.

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